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SPRENGEL (F.). **Über die Kropfkrankheit an Eiche, Kiefer, und Fichte.**

[Note on the 'goitre' disease of Oak, Pine, and Fir.]—*Phytopath. Z.*, ix, 6, pp. 583–637, 53 figs., 1936.

Under the general term 'Kropf' [goitre] the author describes and discusses the nodosities, frequently attaining considerable dimensions, which in many localities in Germany and elsewhere may develop on stems of oak, pine, and fir, causing considerable depreciation of their value. Most frequently the disease occurs in groups of trees standing close together. The swellings originate from a disturbance in the cambium, and may either remain covered with more or less normal bark, or may assume the aspect of broken-down cankers, affording entry to wound organisms. No clue to the causal agency of the condition was obtained, but the balance of evidence indicated that it may be due to an hereditary predisposition of certain trees to such formation in response to certain unknown environmental factors. Affected trees should not be used either for vegetative or seed propagation, since cuttings from diseased oaks always reproduced the trouble, and young trees in stands should be removed immediately the disease becomes apparent, to prevent them from dropping their seeds.

GOIDÀNICH (G.). **Comportamento dell' 'Ulmus pumila' L. nella pratica agricola e la sua resistenza alla grafiosi.** [The behaviour of *Ulmus pumila* L. in agricultural practice and its resistance to graphiosis.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 199–207, 7 figs., 1936.

Two cases of natural infection by *Graphium* [*Ceratostomella*] *ulmi* [R.A.M., xvi, p. 217] of *Ulmus pumila* in Italy are described, one observed in the neighbourhood of Bologna on a tree grafted on *U. campestris* and the other on an ungrafted tree in Forlì; the author confirms, however, the resistance of the species to *C. ulmi* and recommends its use for forestry and ornamental purposes and as vine supports [*ibid.*, xiii, p. 481]. The attention of growers is directed to the natural hybrids of *U. pumila* and *U. campestris* or other species, which are probably susceptible and should not be planted. In the province of Bologna *U. pumila* was affected by a tracheomycosis due to *Verticillium albo-atrum* [*ibid.*, xv, p. 474], the symptoms in the wood being almost identical with those due to *C. ulmi*.

MELLONI (M.). **Disseccamenti dei rami di Olmo provocati da due sferopsidali.** [Desiccation of Elm branches caused by two Sphaeropsidales.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 208-213, 7 figs., 1936.

Branches of *Ulmus campestris* which had wilted from the apex downwards, the diseased portion being separated off from the healthy part by a crack which laid bare the wood and generally extended all round the branch, were received from Ancona, Italy, and showed the presence of *Cytospora* [*Valsa*] *ambiens* [*R.A.M.*, xv, p. 448] in some cases and *Botryodiplodia malorum* [*Physalospora mutila*: *ibid.*, xi, p. 212; xvi, p. 335] in others.

Inoculations of growing elm branches made by inserting pieces of cultures of the fungi in wounds in the bark gave positive results in one month both when the fungi were used separately and when a mixed inoculum was inserted.

COUDERC (M.). **Les porte-greffes du Châtaignier et la maladie de l'encre.** [Chestnut stocks and ink disease.]—*Progr. agric. vitic.*, cvi, 39, pp. 305-308; 41, pp. 352-356; 44, pp. 423-427; 45, pp. 449-452, 8 figs., 1936.

After briefly reviewing recent breeding work against ink disease of the chestnut [*Phytophthora cambivora*: *R.A.M.*, xiii, p. 63; xvi, p. 72] in France, the author describes the botanical characters, and where possible, the commercial potentialities of a number of Chinese and Japanese varieties (out of a total of 550 trees) for use either as stocks for European chestnuts or as direct producers. He states that the results so far obtained indicate that all are resistant to the ink disease, and a study is now being made to find the varieties most suitable for French conditions.

GÄUMANN (E.). **Der Einfluss der Fällungszeit auf die Dauerhaftigkeit des Buchenholzes.** [The influence of the felling time on the durability of Beech wood.]—*Mitt. schweiz. Zent. Anst. forstl. Versuchsw.*, xix, 2, pp. 382-456, 1 fig., 9 graphs, 1936. [French summary.]

Beech stems felled during the period from December to March underwent no deterioration in the Sihlwald (central Switzerland) in 1933 and 1934 even when left for an entire year in the open. On the other hand, the incidence of decay in the May to June, July to August, and September to November fellings amounted to 21.9, 40.8, and 11.4 per cent., respectively. Compared with the conifers subjected to analogous tests under similar conditions [*R.A.M.*, x, p. 146], beeches proved relatively susceptible to fungal decay, induced chiefly by *Stereum purpureum* [*ibid.*, xi, p. 414], *Hypoxylon coccineum* [*ibid.*, xiii, p. 197], *Schizophyllum commune*, and *Xylaria hypoxylon* [*ibid.*, xi, p. 318], the two latter being only semi-parasitic and commonly found in company with the pure saprophytes, *Polystictus versicolor*, *Polyporus vaporarius* [*Poria vaporaria*], and *Polyporus adustus* [*ibid.*, xvi, p. 4]. The temperature relations of these organisms are so divergent (optimum for *Stereum purpureum* and *H. coccineum* 24° to 27° C., for

Schizophyllum commune 30° to 33°, and for *X. hypoxylon* 15° to 21°) that they may attack the wood at any time of year, provided it is not actually frozen, but the sap is renewed after thawing in the stems felled in the winter and early spring, with the result that tyloses are formed and the cell walls acquire a high degree of resistance to invasion, which is not maintained in the later fellings. The incidence of fungal rotting may be somewhat reduced by leaving the trees lying in the open for a month (until the leaves are wilted) before cutting. Beeches fructify in general every 5 to 7 years, and during this period the resistance of the wood to decay by the saprophytes, *Polystictus versicolor* and *Poria vaporaria*, is increased by one-third to one-half, whereas the reaction to parasites is not affected.

WHETZEL (H. H.) & BUCHWALD (N. F.). **North American species of *Sclerotinia* and related genera. III. *Ciboria acerina*.**—*Mycologia*, xxviii, 6, pp. 514–527, 19 figs., 1936.

A description is given of the cultural characters and life-history of a new species of *Ciboria*, named *C. acerina* [with a diagnosis in English], found in New York on the fallen overwintered male and female inflorescences of *Acer rubrum* and on the male inflorescences of *A. saccharinum*, *Myrica gale*, *Salix discolor*, and *Ostrya virginiana*. The fungus has short, stout, 4-spored asci measuring 75 to 107 by 7.5 to 8.8 (average, 92 by 7.7) μ , and ellipsoid, hyaline, smooth, uniseriate ascospores measuring 10 to 15 by 5 to 6 (11.9 by 5.5) μ , slightly flattened on one side, and occupying the upper two-thirds of the ascus.

The inoculation of flowers by allowing ascospores to drop on them resulted in infection of the stamens, through which alone invasion could occur. The female flower parts could not be infected artificially, but are attacked occasionally in nature.

The life-history of the fungus is as follows. The apothecia begin ascospore discharge in late March or early April, as the maple flowers open, and continue for three or four weeks. The ascospores infect the stamens, at least 24 hours' moisture being requisite to ensure infection, and the mycelium invades the tissues of the calyx, pedicels, and bud scales round the flower clusters. These fall and are mummified by the mycelium, from the dense stromata of which one to several apothecia arise in early spring.

Microconidia were produced in culture but have not yet been observed in nature. There is no evidence that the fungus has any true conidial stage.

Annual Report of the Division of Forestry, Union of South Africa, for the year ended 31st March, 1936.—47 pp., 4 pl., 1936.

The following items of phytopathological interest occur in this report. *Armillaria mellea* was fairly active in the Klein Australia and Timbadola pine plantations [*R.A.M.*, xiii, p. 425], where infected trees were grubbed out and burnt. The primary cause of the spasmodic dying-off of pines in the Cape Peninsula appears to be the soil-inhabiting fungus *Rhizoctonia lamellifera* [*ibid.*, xii, p. 727], though the trouble is obviously aggravated by drought. The most promising of the various timber preservatives tested was a creosote oil obtainable to standard

specifications from Iscor, Pretoria. Tan bark wattles [*Acacia* spp.] are subject to an obscure form of gummosis, a serious aspect of which is the liability of the diseased trees to longicorn beetle (*Ceroplesis thunbergii* and *Pyonopsis brachyptera*) infestation.

GAISBERG (ELISABETH V.). **Die Adelopus-Nadelschütte der Douglasie in Württemberg. Vorläufige Mitteilung.** [The *Adelopus* needle fall of the Douglas Fir in Württemberg. Preliminary note.]—*Silva*, xxiv, 51–52, p. 420, 1936.

The needle fall of Douglas firs [*Pseudotsuga taxifolia*] caused by an *Adelopus* [*R.A.M.*, xvi, p. 147 and next abstract] is stated to be spreading northwards in Germany from Upper Suabia, where it was originally located, no doubt as a migrant from Switzerland. The fungus attacks not only the slowly growing mountain forms but also the rapidly developing coastal types, and may induce complete defoliation in extreme cases. Further studies on the disease are in progress.

ROHDE (T.). **Adelopus gäumannii n.sp. und die von ihm hervorgerufene 'Schweizer' Douglasienschütte. Eine vorläufige Mitteilung.** [*Adelopus gäumannii* n.sp. and the 'Swiss' Douglas Fir leaf fall caused by it. A preliminary note.]—*Silva*, xxiv, 51–52, pp. 420–422, 1936.

The genus *Adelopus*, a new species of which is associated with the destructive needle-fall of Douglas firs (*Pseudotsuga taxifolia*) in Austria, Great Britain, Germany, and Switzerland [see preceding abstract], was hitherto represented only by *A. balsamicola* (more correctly named *A. nudus*, as shown by an examination of North American type material), a pure saprophyte restricted to *Abies* spp. The new species is named *A. gäumannii* [with a Latin diagnosis] and is characterized by spherical, dull black perithecia, 32 to 86 μ in height by 41 to 93 μ in diameter (average 65 by 67 μ), with a stalk 7 to 22 μ in thickness (14 μ), containing less than 15 paraphysate, clavate to cylindrical, often ventricose asci, 24 to 48 by 5 to 16 (36 by 10) μ , occupied by distichous, hyaline ascospores, 9 to 15 by 3.5 to 5.2 (12 by 3.9) μ , with a median septum. The imperfect stage of the fungus has only been observed in pure culture developing on the sparse, black mycelium as a sclerotial mass that disintegrated into oidiod elements. The presence of the oidial phase in *A. gäumannii*, the larger number of asci (15 to 30) in *A. nudus*, and other morphological and cultural characters serve to distinguish the two species, though a close relationship is also apparent between the strictly specialized parasite of *P. taxifolia* and the widespread saprophyte on *Abies*. Inoculation experiments are necessary definitely to establish the presumed etiological connexion between *Adelopus gäumannii* and the Douglas fir needle-fall.

The current season's needles are often shed very early, before the formation of the *Adelopus* fruit bodies, a phenomenon probably due in part to infection by a *Rhizosphaera* previously observed in a similar relationship with *Rhabdocline pseudotsugae* on the same host [*R.A.M.*, xvi, p. 147]. On the other hand, needles infected by *A. gäumannii* may survive for several years, three being the most common period. The mycelium may be present for months in the tissues without inducing any external symptoms, and not until the late autumn or winter is

there any sign of the black hyphal masses that slowly develop into fruit bodies during the next season. Each new needle as it develops is attacked by the fungus, so that ultimately not a sound one remains on the tree. There is reason to believe that older needles are also subject to infection, though in a lesser degree than the young ones.

NĚMEC (A.). **Studie o kareňních zjevech u Borovice v lesní školce v Řevnicích.** [Studies on deficiency symptoms in Pines in the forest trees nursery at Řevnice.]—*Ann. Acad. tchécosl. Agric.*, xi, 5, pp. 531-534, 1936. [German summary.]

An account is given of an investigation at the forest tree nursery in Řevnice, Czecho-Slovakia, of a pathological condition of pine seedlings (chiefly one-year-old), characterized by a dull violet discoloration of the needles, which is frequently observed in the autumn or after the first few frosts. Analysis of the soil within the rhizosphere of affected and sound seedlings, supported by the chemical analysis of the tissues of healthy and diseased plants, suggested that the condition is due to deficiency of the soil in phosphoric acid and also in lime, and further work is now in hand to determine whether this hypothesis is correct, and whether the trouble may be controlled by adequate fertilization of the soil.

[A German version of this paper is also published in *Forstwiss. Zbl.*, lviii, 23, pp. 798-808, 1936.]

DIMITROFF (T.) & BIOLTSCHIEFF (A.). Приносъ къмъ изучаване поврежденията въ нашитѣ гори. [Contribution to the study of damage to our forests.]—*Annu. Univ. Sofia*, xiv, Sect. V, Fasc. 2, pp. 169-203, 1 map, 19 figs., 1936. [French summary.]

In this account of the different kinds of damage that are caused to Bulgarian forest trees, chiefly conifers, by various environmental and other agencies, a few lines are devoted to *Pythium de Baryanum* which, in 1935, caused a destructive blight of pine seedlings in a forest-tree nursery, where soil irrigation was excessive. *Peridermium pini* [R.A.M., xvi, p. 288] was observed in the same year causing severe damage to a 30- to 40-year-old 'white pine' [*Pinus sylvestris*] tree. The Bulgarian native pine (*P. peuce*) is stated to be immune from white pine blister rust (*Cronartium ribicola*) [ibid., xvi, p. 287], and is recommended as a possible substitute for the other European five-needle white pines, all of which are heavily attacked by the parasite. *Chrysomya abietis* [ibid., xv, p. 411] caused very severe defoliation in a young stand of spruce.

LIUBARSKI (L. V.). О грибныхъ болезняхъ леса в Зейскомъ и Рухловскомъ районахъ ДВР. [Fungal diseases of forest trees in the Zeya and Rukhlovo districts of the Russian Far East.]—*Bull. Far Eastern Br. Acad. Sci. U.S.S.R.*, 1936, 17, pp. 79-85, 1936. [English summary.]

As a result of his survey in 1932 of the forests in the river Zeya and the Rukhlovo districts of the Russian Far East, the author states that larch (*Larix dahurica*) stands suffer very considerably from insect attacks and even to a greater degree from trunk and root rots, among which the following are listed as the more important, namely, *Trametes*

[*Fomes*] *pini* [*R.A.M.*, xvi, p. 3], *Fomes officinalis*, *F. annosus* [*ibid.*, xvi, p. 145], *Polyporus schweinitzii* [*ibid.*, xvi, p. 76], and *P. sulphureus* [*ibid.*, xvi, p. 4]. The chief fungal diseases of the pine (mainly *Pinus sylvestris*) are stated to be *Peridermium pini* [see preceding abstract], *F. pini*, *Ceratostomella pilifera* [*ibid.*, xv, p. 69], *Polyporus volvatus*, and *Cronartium quercus* Schroet. [*C. quercuum* Miyake: *ibid.*, xv, p. 124]. The last-named causes the formation on the branches of galls, frequently 30 cm. or more in diameter, and while the rust does not appear to affect the growth of the pine, the large galls often break the branches bearing them, owing to their great weight, thus favouring the infection of the trees by wound parasites. The galls, however, are valuable for the extraction of turpentine, with which they are copiously supplied. The paper contains a full list of the fungi (30) which have been recorded on conifers and the birch (*Betula platyphylla*) in that region.

PILÁT (A.). **Monographie der europäischen Polyporaceen mit besonderer Berücksichtigung ihrer Beziehungen zur Landwirtschaft.** III Teil. [A monograph of the European Polyporaceae with special reference to their connexions with agriculture. Part III.]-*Beih. bot. Zbl.*, Abt. B, lvi, 1-2, pp. 1-82, 8 pl., 11 figs., 1936.

Critical notes are given on the distribution, morphology, taxonomy, and phytopathological significance of 15 European species of the genus *Polyporellus* Karst. which is here used for forms representing a transitional stage between the Polyporaceae and Agaricaceae as exemplified by *Lentinus*. Among the fungi enumerated, the following cause intensive wood rots in Czecho-Slovakia and elsewhere: *P. (Polyporus) brumalis* [*R.A.M.*, vii, p. 689], *Polyporellus (Polyporus) arcularius* [*ibid.*, ix, p. 75; xvi, p. 221], *Polyporellus (Polyporus) squamosus* [*ibid.*, xiv, p. 794], the agent of a white decay of beeches in the Carpathians (including those of the U.S.S.R.), walnuts, and numerous other trees in central European parks, and *Polyporellus (Polyporus) picipes* [*ibid.*, x, p. 271], causing a white rot of willows and beeches.

SCHMITZ (H.) & KAUFERT (F.). **The effect of certain nitrogenous compounds on the rate of decay of wood.**-*Amer. J. Bot.*, xxiii, 10, pp. 635-638, 1936.

Since the nitrogen requirements of wood-destroying fungi are high and the nitrogen content of wood is low it is conceivable that the rate of decay of wood-destroying fungi may be increased by increasing the available nitrogen [*R.A.M.*, xiii, p. 485]. In the experiments described the addition of asparagin to Norway pine (*Pinus resinosa*) sapwood clearly increased the rate of decay by *Lenzites trabea*. Whereas the average loss in weight of the controls amounted to 32.97 per cent., the average loss in the culture flasks to which 0.1 and 1 per cent. asparagin solutions were added was, respectively, 35.59 and 47.45 per cent. The addition of 1 per cent. asparagin solution to paper birch (*Betula papyrifera*) sapwood increased the rate of decay by *Polystictus versicolor* nearly four times but did not cause consistent differences in the rate of decay of the heartwood. The addition of ammonium nitrate to sapwood and heartwood of Norway pine and paper birch increased the rate of decay caused by the respective fungi only when a 0.5 per

cent. solution was added to Norway pine heartwood. In all other cases, the addition of a 0.5 or 1 per cent. solution of this salt caused significant decreases in the rate of decay. These results suggest that resistance to decay may sometimes be due to the nutritive properties of the wood, the organic nitrogen content of which may play an important part in this connexion.

KAMESAM (S.). A note on protecting Indian structural timbers against fire, termites, borers and fungi (rot).—*Indian For. Rec.*, N.S., *Utilization*, i, 4, pp. 93–113, 1936.

This is a concise discussion of certain aspects of timber preservation against fungal and other forms of decay in India. The timbers used for structural purposes are classified on the basis of natural durability and the intensity of protective treatment required. b) amenability to impregnation under pressure with fire-proofing or antiseptic fluids, and some data are given concerning the economics of preservation, with special reference to the ascu process [*R.A.M.*, xvi, p. 146].

BURKE (O. D.) & KIRBY (R. S.). Control of the diseases of vegetable crops.—*Circ. Pa agric. Exp. Sta.* 173, 16 pp., 1936.

Popular notes are given on some well-known fungal, bacterial, and virus diseases of the chief vegetable crops of Pennsylvania, accompanied by concise directions for their control by cultural methods, seed treatment, and spraying.

CHAMBERLAIN (E. E.). Turnip-mosaic. A virus disease of crucifers.—*N.Z. J. Agric.*, liii, 6, pp. 321–330, 5 figs., 1936.

Turnip mosaic [*R.A.M.*, xiv, p. 731] was first recognized in New Zealand in 1932, when it was found on rape [*Brassica napus*] at the Plant Research Station Area, Palmerston North. Since then it has become a serious disease of swedes, rape, and turnips in the locality mentioned, and has been noted also in a number of districts throughout the Dominion. On swedes the characteristic symptom is a diffused mottling of the leaves, accompanied by crinkling, but occasionally, the mottling consists of dark green, blistered areas. Only leaves developing after infection has taken place are affected. The diseased plants soon become stunted, and the bulbous portion of the root is under-sized and liable to soft rot [*Bacillus carotovorus*: *ibid.*, xv, p. 468]. On turnips the symptoms tend to be more pronounced. In trials conducted in 1934–5, the disease caused a loss of yield on rape equivalent to 25.4 per cent., the figure the following season being 26.1 per cent. The disease was transmitted experimentally by juice inoculations from swede to turnip and swede, and from rape to turnip, by *Brevicoryne brassicae* from swede to swede and turnip, and by *Myzus persicae* from swede, Brussels sprouts, cabbage, broccoli, and cauliflower to swede and vice versa. Attempts at seed transmission were unsuccessful.

In a resistance trial with 70 lines of different swede varieties and strains mosaic became general among the plants, but ten varieties showed from 0 to 78 per cent. mosaic as against an average of 92.7 per cent. for the others. Sutton's Sensation was outstanding in resistance (0.0 per cent. infection though a few plants became infected

later), while Wilhelmsburger Otofte, Imperial (Webb's No. 2 strain), and Sharpe's A 1 were moderately resistant. The control measures recommended in crops grown for seed consist in dipping the leaves at transplanting in nicotine or nicotine sulphate solution, regular roguing of infected plants, avoidance of cruciferous crops in the vicinity, removal of volunteer seedlings, and spraying with nicotine against aphids as soon as the disease appears.

HURST (R. R.) & MACLEOD (D. J.). **Turnip brown rot.**—*Sci. Agric.*, xvii, 4, pp. 209–214, 4 pl., 1936. [French summary.]

Brown heart of turnips [*R.A.M.*, xvi, p. 324] in Canada, as shown by investigations started in 1928, is responsible for heavy annual losses to the growers, an estimate based upon rejections of consignments at shipping points for the United States indicating that the direct cash loss due to this disease may be as high as \$50,000 in a single year. Three years' tests in the Maritime Provinces demonstrated that boron is essential for the normal development of turnips, and that brown heart can be controlled by means of this element. Very satisfactory results have been obtained by applications of finely powdered borax at the rate of 15 to 20 lb. per acre, without causing injury to ordinary crops in subsequent rotations; higher doses, however, may be injurious. The borax may be applied in the drill, at the sides of the drill rows, broadcast, or combined with fertilizers or manure and dispersed by means of the ordinary machine spreaders, but the general inclusion of borax with commercial turnip fertilizers is not recommended for the present since additional boron is not always required. Stable manure alone was slightly more effective than fertilizer alone in the control of brown rot, indicating that the former contains traces of boron. Heavy liming of the soil was found to predispose the turnip to the disorder, and borax was less effective in naturally alkaline soils.

WOODCOCK (J. W.). **Brown-heart of Swedes. Dry matter and sugar content of affected roots.**—*N.Z. J. Agric.*, liii, 6, pp. 365–366, 1936.

Analysis of healthy and brown heart swedes [see preceding abstract] of four varieties from different localities in New Zealand showed that in the former the dry matter ranged from 8.5 to 12 per cent. and the sugar from 4.4 to 6.5 per cent., whereas in the latter the corresponding figures were 8.5 to 10.9 and 3.6 to 5.3 per cent.

BÖNING (K.). **Untersuchungen über Meerrettichkrankheiten und deren Bekämpfung.** [Investigations on Horse-radish diseases and their control.]—*Angew. Bot.*, xviii, 6, pp. 482–494, 5 figs., 1936.

The most important horse-radish disease in Bavaria, where this crop constitutes an important source of profit to small-holders, is stated to be white rust [white blister] (*Albugo candida*) [*Cystopus candidus*: *R.A.M.*, xiv, p. 419], which frequently develops on the leaves and petioles in association with *Peronospora parasitica* and is also responsible for a brown rot commencing at the head of the rootstock and extending downwards. Proof has been obtained of the overwintering of the mycelium in the diseased tissues by the planting out in the spring of contaminated material, from which arise shoots with primary infection

in the shape of deformed leaves and petioles covered with the white pustules of the fungus. The control of *C. candidus* presents considerable difficulties. Of the various standard fungicides tested, lime-sulphur is ineffectual and ordinary Bordeaux mixture very injurious to the plants; better but somewhat uncertain results were given by Wacker's Kupferkalk [ibid., xvi, p. 230] and nosprisit O. There is some promise of the successful development of a Hungarian horse-radish variety combining resistance to white blister with other desirable characters.

Contrary to Klebahn's opinion, the writer maintains that the destructive and widespread root blackening is due to *Verticillium dahliae* [ibid., xiv, p. 419], which may generally be isolated in pure culture and in an extensive series of inoculation experiments successfully reproduced the disease. The few instances in which isolation experiments have failed are attributed to the fact that vascular discoloration occurs in advance of the actual presence of the fungus. The blackening disease is most prevalent in relatively dry soils with little humus, an excess of lime, and a deficiency of any one essential nutrient, all of which factors tend to weaken the constitution of the host and promote the growth of the pathogen. Crop rotation (at most once in four years) and the use of healthy planting stock are the principal measures to be adopted against the fungus which attacks a number of other crops, such as potato, lupins, and clovers, and many weeds. Cuttings destined for planting should be kept until required in fresh, healthy soil, pure sand, or peat mould, or mixtures of these. All the leading varieties (Bavarian, Spreewald, and Silesian) seem to be susceptible to *V. dahliae*, but the existence of individual differences encourages the hope of breeding resistant strains.

Excessive soil moisture predisposes the horse-radish crop to two bacterial diseases, namely, 'core rot' and 'red brittleness', the former characterized by rust-brown circles or half moon-shaped structures in the central cylinder, leading to complete disintegration, and the latter by an external rust-brown discoloration of the root, the healthy tissues of which are generally separated from the diseased by wound cork. Transitional stages of these disorders also occur, in which both external and internal symptoms may be observed. The bacteria isolated from infected roots reproduced most of the foregoing symptoms and are presumably concerned in the etiology of the conditions described. Infection is perpetuated through the soil and by means of contaminated planting stock.

Storage rots are due to common bacterial agents of decay, *Sclerotinia sclerotiorum*, and *Penicillium*.

Crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) [ibid., xiii, p. 291], like the above-mentioned bacterial diseases, is transmissible by cuttings, which should be dipped before planting in a loam emulsion with the admixture of a dilute disinfectant solution.

RINDLER (J.). **Über die Bekämpfung der Blattfleckenkrankheit in Oberösterreich.** [On the control of the leaf spot disease in Upper Austria.]—*Z. Zuckerindustr. ösl. Repub.*, lxi, 17, pp. 135-136; 18, 141-144, 1937.

An account, supplemented by numerous statistical data in tabular

form, is given of recent experiments in the control of beet leaf spot (*Cercospora beticola*) in Upper Austria [*R.A.M.*, xiv, p. 813; xvi, p. 227], where particularly good results have been obtained by five applications of the copper-lime dust (10 per cent. copper) cuprispora Mantov at the rate of 9 to 11 kg. per Joch [15.7 to 19.1 kg. per hect.]. This greenish, amorphous, non-water-soluble powder is also available in a satisfactory liquid form (24 and 40 per cent. cuprispora Mantov). In 1935 the leaf and beet yields on the dusted areas were 21.8 and 16.66 per cent. higher than those on the untreated plots.

KALLBRUNNER. *Ist das Bespritzen der Rübenblätter mit Kupfersalzen nachteilig für die Verfütterung?* [Is the spraying of Beet leaves with copper salts detrimental to feeding to livestock?]*—Dtsch. landw. Pr.*, lxiii, 52, p. 656, 1936.

According to W. Liebscher, of the Federal Agricultural and Chemical Experiment Station, Vienna, no adverse effects need be expected to follow the use as fodder of beet leaves sprayed with copper salts against *Cercospora* [*beticola*: see preceding abstract] provided the applications are made at least eight weeks before harvest and the foliage is thoroughly fermented in the silo. The consumption by ten cows during 41 days of quantities of fermented beet leaves ranging from 20 to 40 kg. (1.93 to 3.86 gm. copper) did not impair the animals' health, reduce their weight, or affect the composition and consistency of their milk.

CHECCUCCI (G. M.). *Seme nazionale di Bietole zuccherine.* [Indigenous Sugar Beet seed.]—*Industr. saccar. ital.*, xxix, 12, pp. 569-574, 1936.

In connexion with a strenuous campaign for extension of the Italian sugar beet industry, mention is made of the successful efforts of Prof. Munerati in the development, by the hybridization of commercial with native wild strains, of selections retaining their foliage through the hot summer weather without requiring repeated copper treatments against *Cercospora* [*beticola*: *R.A.M.*, ix, p. 576, and preceding abstract]. By means of these strains it is hoped to prolong the present factory season of two months to about double that length of time.

VAN SCHREVEN (D. A.). *Kopergebrek bij de Suikerbiet.* [Copper deficiency in Sugar Beet.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 1936, 2, pp. 37-57, 4 figs., 1936. [French summary.]

Hilleshög beet and Victory oats seedlings were grown in water cultures and in nutrient solutions with and without copper, 'Kahlbaum pro analyse' chemicals twice recrystallized in double-distilled water being used. The oats receiving no copper displayed the symptoms of copper deficiency described by Brandenburg [*R.A.M.*, xv, p. 145] at the end of four weeks, while the beets had already begun to manifest traces of chlorosis [*ibid.*, xiv, p. 209] after 19 days, the leaves assuming a mottled pale green to greenish-yellow and bluish-green or dark green coloration and feeling somewhat thinner to the touch than those of the healthy controls given 0.5 mg. copper sulphate per l. of solution. At the end of two months the oldest leaves developed a localized necrosis of the foliar parenchyma, the colour of which ranged from greyish-

brown to grey or white. The diseased foliage produced little or no starch. The lateral roots of copper-deficient beets were generally pure white and longer and more tapering than those of healthy ones, while the tap-root was stunted. Copper would thus seem to be essential to the formation of chlorophyll in beets.

The oats were uprooted after 46 days, at which stage the copper-deficient plants averaged only 25 cm. in height compared with 45 cm. for the healthy controls. The average weight of the tap-roots of copper-deficient beets at the end of 71 days was 10.522 ± 0.221 gm. compared with 30.597 ± 1.4 gm. for those of healthy plants, while the average sugar contents were 15.2 and 16.85 per cent., respectively.

On the basis of these results the copper deficiency disorder must therefore be added to the list of beet diseases characterized by chlorosis [ibid., xv, p. 417].

[An English version of this paper appears in *Phytopathology*, xxvi, 12, pp. 1106-1117, 2 figs., 1936.]

DUNDAS (B.). **Inheritance of resistance to powdery mildew in Beans.**—*Hilgardia*, x, 8, pp. 243-253, 1936.

In this full account of the author's study in California of the inheritance of resistance of bean (*Phaseolus vulgaris*) powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, xiv, 207] it is stated that the Hungarian, Lady Washington, Pinto, and Pink varieties were found to be resistant, and Robust and Red Kidney susceptible as tested by inoculations of detached leaflets on 10 per cent. sucrose solution in Petri dishes, by greenhouse inoculations, and by observations of natural infections in the field. The Frijole negros variety was resistant in the field and greenhouse, and semi-resistant in the dishes, while Long Roman was semi-resistant in the field and greenhouse, and susceptible in the dishes.

Of 45 plants of the F_2 progeny of a cross between Robust and Pinto, 12 were homozygous resistant, 23 heterozygous resistant, and 10 homozygous susceptible. Of 47 resistant plants of the F_2 progeny of a cross between Long Roman and Pinto, 16 were homozygous and 31 heterozygous. Readings of 0 (no mycelium) and t (trace of infection, scant mycelium, no spores) on the scale of infection (0 to 4) adopted in the F_2 plants indicated homozygosity or heterozygosity for resistance, 1 and 2 indicated heterozygosity only, and 3 and 4, homozygosity for susceptibility. In the crosses with Robust and Long Roman, the Pinto variety had a single Mendelian factor pair for resistance.

MOORE (W. D.). **Powdery mildew (*Erysiphe polygoni*) on garden Snap Beans.**—*Phytopathology*, xxvi, 12, pp. 1135-1144, 2 figs., 1936.

Powdery mildew (*Erysiphe polygoni*) of garden beans (*Phaseolus vulgaris*) [see preceding abstract] is stated to have been assuming increasing importance during the last ten years in the south-eastern United States, especially in the autumn crops, and studies were accordingly carried out from 1931 to 1935 in a vegetable-growing centre of South Carolina on the development and control of the disease. Of the 33 varieties on which observations of natural infection were made, 7 (including the important commercial Bountiful) were severely

attacked 15 (including Giant Stringless Green Pod, Black Valentine, and Konserva) moderately, and 12 (including Asgrow Valentine and Sure Crop Wax) lightly. Infection having been found consistently to follow the late September and early October rains, the time for initiating control measures can be gauged with a fair amount of accuracy; the first application should coincide with the inception of the foliar symptoms (circular, white, powdery spots) and one to two repetitions at 10- to 14-day intervals will usually suffice. Satisfactory results were obtained with 100 per cent. sulphur dust (ordinary and Koppers), 75-25 sulphur-lime dust, flotation sulphur spray 1-160, and other sulphur compounds, the dusts being more effective, cheaper, and simpler to handle than the sprays.

MADLER (H.). **Wie kann die Fusskrankheit des Spargels bekämpft werden?** [How can the foot rot of *Asparagus* be combated?]
—*Kranke Pflanze*, xiii, 12, pp. 213-215, 1936.

Measures for the control of foot rot of asparagus (*Fusarium culmorum*) [*R.A.M.*, xiv, p. 735] should include the heating of the manure for the beds to a temperature of 50° to 70° C. to destroy the causal organism on the fragments of straw, wider spacing of new plantings, and the application to diseased stems of a 0.5 per cent. solution of ceresan or uspulun, followed a few days later by the removal and burning of all infected material, with the stumps.

FIKRY (A.). **Powdery mildew of Cucurbitaceae.**—*Bull. Minist. Agric. Egypt* 175, iii+25 pp., 24 pl. (2 col.), 1936.

Powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xv, p. 667; xvi, p. 13] is one of the most destructive diseases of cucurbits in Egypt, attacking all species except the watermelon, which is only affected in damp localities such as the northern part of the Delta. Crops raised during the autumn and winter are more heavily infected than those grown in the summer and spring, evidently owing to the high humidity of the former period. Temperature is also an important factor. The results of control trials showed that two applications of Bordeaux or Burgundy mixture (1 per cent.), the first when the disease appears and the second three or four weeks later, controlled the mildew completely, but sulphur was equally effective, was the easiest fungicide to use, and gave the greatest increase in yield, sometimes up to ten times that of the controls. The sulphur is put into a two-layer muslin bag attached to a wooden frame with a hole for the insertion of the sulphur, and this 'duster' is shaken over the diseased plants; a third application of fungicide may occasionally be necessary.

RODIGIN (M. N.). О мучнисторосяных грибах на Тыквенных (***Sphaerotheca fuliginea* (Schl.) Poll. и *Erysiphe cichoracearum* Fr.**). [Note on the powdery mildews of cucurbits (*Sphaerotheca fuliginea* (Schl.) Poll. and *Erysiphe cichoracearum* Fr.).]—*Sovetsk. Bot.*, 1936, 5, pp. 120-123, 1936.

The author states that careful investigations in 1934 showed the occurrence in the Volga basin of both *Sphaerotheca* [*humuli* var.]

fuliginea [R.A.M., xii, p. 650] and *Erysiphe cichoracearum* [see preceding abstract] on cucurbits. Perithecia of the two fungi occur but rarely in nature, but those of the former species were invariably associated with a light rusty brown efflorescence on the host leaves, and those of the latter with a flour-white efflorescence. These macroscopical characters are considered to be sufficient for the identification of these powdery mildews in the absence of the perithecia.

CAYLEY (DOROTHY M.). **Spores and spore germination in wild and cultivated Mushrooms (*Psalliota* spp.).**—*Trans. Brit. mycol. Soc.*, xx, 3-4, pp. 225-241, 1 pl., 2 figs., 1936.

The varieties of cultivated mushrooms used in these germination studies were (1) a fuscous variety with 1- to 4-spored basidia, (2) a white, non-fragrant variety with 1- to 5-spored basidia, and (3) a white, fragrant variety with 2-spored basidia. The last-named was met with only once on the English market. Two-spored basidia predominate, but an appreciable percentage of 3-spored basidia occur in types (1) and (2), whereas the wild species *Psalliota campestris* and *P. arvensis* have uniformly 4-spored basidia.

Preliminary experiments showed that the first shed spores of an immature sporophore do not germinate under artificial conditions; to obtain germination the pileus must be fully expanded and the gills umber, and consecutive spore traces from single pilei should be taken at intervals of 12 to 24 hours according to the following method: A flanged lid (from a 4 oz. Country Life tobacco tin) with a rectangular central hole cut in it, is placed after flaming in a 4 in. Petri dish (which it fits), so that the flange rests on the edge of the lower half of the dish, and the hole is immediately above a sterile slide in the dish. A sector from the pileus is placed over the whole and the lid of the Petri dish replaced. The slide with the spore trace is replaced as required. Before storing, the slides should be allowed to dry for 24 hours and then covered with another sterile slide, the two slides fixed together at one end with gummed paper and wrapped in cellophane or paper. Spores remain viable for about 6 months.

To germinate the spores, a hollow-ground slide is placed in a Petri dish on a moist filter paper with a piece cut out to coincide with the hollow. The dish is sterilized, a few drops of Knop's solution are pipetted into the hollow, and a loopful of spores is gently dipped into the liquid, without stirring, so that the spores remain floating on the surface. The dish is then incubated for about 7 days at 26° to 27° C. Small pieces of vigorous mushroom mycelium placed at the edge of the solution 7 to 10 days after sowing stimulate germination. Results are given of spore germination tests by the method described, up to 59.5 per cent. germination being recorded after 14 days. The spores require an incubation period of from six to seven days before they germinate.

In view of the uncertain origin of the cultivated varieties the author regards them merely as cultivated forms of *Psalliota*, though with the exception of the fuscous form, they approach most nearly to *P. campestris*. A description by Miss Wakefield of two forms (white and brown) of cultivated mushroom is appended.

VIDAL (J. L.). **Contre la chlorose de la Vigne.** [Control of chlorosis of the Vine.]—*Rev. Vitic., Paris*, lxxxv, 2212, pp. 400–403, 1936.

The tabulated results of an experiment in 1935, in which badly chlorotic vine-stocks on chalky soil in south-west France had their pruning wounds swabbed in early winter with various chemical solutions, showed that the best control of chlorosis [*R.A.M.*, xv, p. 631] was obtained with 25 per cent. copper sulphate plus 6 per cent. citric acid, which raised the estimated yield in wine in 1936 from an average of 48.3 hl. for the controls to 80 hl.; next in efficacy came 28 per cent. iron citrate, with a yield of 78 hl., while 40 per cent. copper sulphate alone only increased the yield by about 30 per cent. Swabbing with 25 per cent. iron sulphate plus 6 per cent. tartaric acid increased the yield to 77 hl. All these treatments had a markedly beneficial effect on the general health of the vines. The results support the view that chlorosis of the vine on calcareous soils is due to a deficiency of iron.

[A somewhat condensed version of this paper is published in *Progr. agric. vitic.*, cvi, 48, pp. 515–516, 1936.]

BRANAS (J.) & BERNON (G.). **Troisième contribution à l'étude du court-noué de la Vigne.** [Third contribution to the study of court-noué of the Vine.]—*Rev. Vitic., Paris*, lxxxv, 2216, pp. 469–472, 1936.

The results of the tests which are briefly described in this paper showed that during the 1936 season the leaves of vines affected with court-noué [*R.A.M.*, xv, p. 630] had a higher content in glucosides than corresponding leaves from healthy stocks, the difference being nearly always due to a higher content in reducing sugars. The same was also found to be true for the defoliated and decorticated one-year-old shoots of affected stocks during the winter dormant period.

SALMON (E. S.) & WARE (W. M.). **Department of Mycology.**—*J. S.-E. agric. Coll., Wye*, xxxix, pp. 16–24, 1937.

Among many items of interest in this report [cf. *R.A.M.*, xv, p. 424] the following may be mentioned. Ripe perithecia of *Venturia inaequalis* and *V. pirina* were found on overwintered apple and pear leaves, respectively, lying on the ground at Wye, Kent, as early as 14th February, 1936. A strain of *Phytophthora syringae* similar to that described by Ogilvie [ibid., xi, p. 111] was obtained in a pure state from Cox's Orange Pippin apples received on 5th October, 1936, from West Sussex, about 50 per cent. of the whole crop being affected. Apart from a few apples of Blenheim Orange, none of the other varieties was affected in the same orchard. The disease did not appear to pass from fruit to fruit in storage.

Fusicladium crataegi [*F. pirinum* var. *pyracanthae*: ibid., xv, p. 230] was found at Lewes on *Crataegus pyracantha*; the fungus occurs commonly at Wye. *Septoria chrysanthemella* and *S. rubi* [ibid., xii, p. 79] caused leaf spots on chrysanthemum and loganberries, respectively. *Gloeosporium fagicola* attacked the leaves of copper beech, probably the first record of this fungus in England.

Hop downy mildew (*Pseudoperonospora humuli*) [ibid., xv, p. 824] was rather severe, though less damage was caused than in the years of

the worst attacks, 1927, 1930, and 1931. Experience in 1936 showed that four applications of Bordeaux mixture instead of the routine three [ibid., xiii, p. 125] may be advisable in exceptionally wet seasons. Nettlehead [ibid., xv, p. 605] continued to become more prevalent in Fuggles gardens, but the new, apparently resistant varieties, Quality Hop, Fillpocket, and Brewer's Favourite, are expected to prove useful in replanting Fuggles gardens rendered unproductive through the disease. Fluffy tip [loc. cit.] persisted in 1936 on hills affected during the previous season, but there was no evidence of lateral spread; the affected hills were estimated to bear only one-third of the crop of the adjoining healthy ones. Fresh cases of the disease occurred near Canterbury. Hop canker caused by *Fusarium (Gibberella)* sp. [ibid., xi, p. 127; xv, p. 462] was unusually prevalent.

VOELKEL (H.) & KLEMM (M.). **Die wichtigsten Krankheiten und Schädigungen an Kulturpflanzen im Jahre 1936. (Beobachtungs- und Meldedienst der Biologischen Reichsanstalt.)** [The most important diseases and injuries of cultivated crops in the year 1936. (Observation and warning service of the Biological Institute).]—*Beil. NachrBl. dtsch. PflSchDienst*, 22 pp., 4 graphs, 56 maps, 1937.

This useful survey of the diseases and injuries affecting cultivated crops in Germany during 1936 has been prepared on the usual lines [*R.A.M.*, xv, p. 425].

POLE EVANS (I. B.). **Pastures and field crops. Annual Report of the Division of Plant Industry.**—*Fmg S. Afr.*, xi, 129, pp. 558-571, 4 figs., 1936.

The following items of phytopathological interest, other than those already noticed from various sources, occur in this report [cf. *R.A.M.*, xv, p. 425]. Mosaic is responsible for very heavy losses in the Transvaal tobacco crop, infection being probably spread mainly by the workers after handling diseased material, since no insect vector has been observed. Leaf curl [ibid., xv, p. 614] has largely disappeared from the Rustenburg tobacco-growing area since the 1932-3 epidemic, but it was present during 1935-6 in certain sections of the Hartebeestpoort irrigation area. Black root rot of tobacco [*Thielaviopsis basicola*: ibid., xvi, p. 348] has recently assumed some importance on black turf soils in the Rustenburg area.

Kromnek [probably identical with spotted wilt] is the most serious disease of tomatoes, causing 60 to 100 per cent. infection in the High- and Middleveld during the period under review. Streak of tomatoes, caused by a mixed infection of potato and tobacco mosaic [ibid., xvi, p. 285], was recently detected for the first time in the eastern Transvaal Lowveld. The Marvel tomato variety is the most resistant to wilt (*Fusarium bulbigenum* var. *lycopersici*) of all those under investigation at Nelspruit [ibid., xiii, p. 548], and should be used as a basis for selection work.

Citrus psorosis [ibid., xv, p. 425] is known to be transmissible from one tree to another, and field evidence denotes that it may be carried in the budwood. The law requires that all infected trees, of which 988

were detected in the Union during the year ended 30th June, 1936, shall be destroyed *in situ*. The results of inoculation experiments on orange stocks have shown conclusively that the disease spreads to the scions and that it cannot be combated by the removal of infected limbs. 'November drop' of oranges reduces the Kat River Valley crop by 20 to 25 per cent. The fruit is shed on reaching a diameter of $\frac{1}{2}$ to $1\frac{1}{4}$ in. Infection by *Alternaria citri* [ibid., xv, p. 716] is suspected, but the fungus has not yet been definitely implicated.

Studies are in progress on the breakdown of stored apples connected with *Penicillium expansum* [ibid., xvi, p. 189]. *Glomerella cingulata* killed the main stems of nursery trees.

Over 60 per cent. of the Uba sugar-cane crop is estimated to be infected by streak [ibid., xv, p. 825], which probably causes an annual loss of over £200,000. Even the most susceptible (Cc. 290) of the new commercial canes is highly resistant to the disease in comparison with Uba, contracting under 1 per cent. infection in districts where Uba is a total failure. Certain maize strains derived from Peruvian Yellow are more resistant to streak than other varieties.

Numerous wheat rust (*Puccinia graminis*) samples from the summer rainfall area were found to belong to biologic form 34, to which only 4 and 2 of the 105 varieties tested are resistant and semi-resistant, respectively [ibid., xvi, p. 87].

Stem rot (*Sclerotium rolfsii*) of carnations [ibid., xiii, p. 327] and peanuts [ibid., xv, pp. 278, 325] has been troublesome in the northern Transvaal. Peach rust [*P. pruni-spinosae*: ibid., xvi, p. 279] caused a blemish noticeable in the canned product. Among the new records are a fruit spot (*Septoria* sp.) on *Passiflora quadrangularis*, and anthracnose (*Sphaceloma* sp.) on violets [ibid., xiv, p. 764].

BRIANT (A. K.). Report on the Agricultural Department, St. Vincent, for the year ended December 31st, 1935.—42 pp., 1937.

In this report it is stated that the banana acreage in St. Vincent increased from 230 to 550 acres during 1935. Panama disease [*Fusarium oxysporum cubense*] occurred in only three stools in the leeward side of the island, and these were destroyed. To protect slightly infected districts the worst area on the windward side was declared an infected area under the Plant Protection Ordinance, and the removal of banana parts to any other locality prohibited.

MANNS (T. F.), DAVIES (F. R.), HEUBERGER (J. W.), & ADAMS (J. F.). Department of Plant Pathology.—Rep. Del. agric. Exp. Sta., 1935-6 (Bull. 205), pp. 37-45, 1936.

The Red June Japanese plum variety (*Prunus salicina*) has been observed regularly to carry more individuals of *Macropsis trimaculata*, the vector of peach yellows and little peach, than any other cultivated plum variety examined [*R.A.M.*, xiv, p. 682; xv, p. 730] and the insects are also stated to be far more prevalent on wild than cultivated plums. In further experiments on the masking of yellows and little peach in plums, 5 Elberta and 5 natural peach seedlings were each budded with two buds from [apparently healthy] plums which had previously been budded with yellows or little peach, or were suspected of being affected,

and it was found that 9 of the plum sources were carrying yellows and 19 little peach, while 3 carried both. Plum buds carrying yellows transmitted infection to 60 and 57 per cent. of the Elberta and natural peach trees, respectively, the corresponding figures for little peach being 20 and 46 per cent.

In comparative tests with different chemical treatments the best control of sweet potato wilt [or stem rot: *Fusarium bulbigenum* var. *batatas* and *F. oxysporum* f. 2: *ibid.*, xv, p. 681] was given by improved semesan bel, though it had a retarding influence on the sett, good results also being obtained with mercuric chloride, Bordeaux mixture (20-20-50), and various copper dusts; McCall's nutrient solution and fungicide 66 [*ibid.*, xv, p. 665] improved the sett.

Complete control of tomato foot rot (*Macrosporium* [*Alternaria*] *solani*) [*ibid.*, xvi, p. 69] in the seed-bed was given by seven sprays with Bordeaux mixture (3-5-50).

An epidemic wilt of watermelons was caused by *F. [bulbigenum* var.] *niveum* [*ibid.*, xvi, p. 85] during 1935, all the plants from which the fungus was obtained belonging to the Stone Mountain variety, except one, the infection being apparently introduced on diseased Stone Mountain seed. Plantings were made of a new resistant Stone Mountain variety called 'Long Mountain' obtained from California.

Bacterium pruni was isolated for the first time on 20th September, 1935, from foliage and twig infection of *Prunus pissardi* in an ornamental planting. When an Elberta peach planting previously heavily infected with *Bact. pruni* was sprayed on 15th March 1936 with Bordeaux-oil emulsion (4-4-50 plus 3 per cent. oil), Du Pont spray no. 2, and commercial liquid lime-sulphur (1 in 10), defoliation resulting from foliage infection was severe on the trees sprayed with lime-sulphur, medium for the Du Pont spray, and light for the Bordeaux-oil spray; in another orchard similarly treated the fruit infection amounted to 3.3, 5.4, and 4.3 per cent., for the three treatments, respectively.

LONGLEY (B. J.), BERGE (T. O.), VAN LANEN (J. M.), & BALDWIN (I. L.). **Changes in infective ability of *Rhizobia* and *Phytomonas tumefaciens* induced by culturing on media containing glycine.**—*Abs. in J. Bact.*, xxxiii, 1, pp. 29-30, 1937.

The cultivation of either *Rhizobium* spp. or *Phytomonas* [*Bacterium*] *tumefaciens* in media containing concentrations of 0.1 to 0.3 per cent. glycine is stated to result in complete loss of infective capacity after some 30 generations. In the case of *Bact. tumefaciens* similar responses were induced by alanine, glycylglycine, and dicyanamide.

KALIAYEFF (A. W.). **Immunité acquise des plantes. Traitement et prophylaxie des tumeurs de *Pelargonium zonale* provoquées par le *Bac. tumefaciens*.** [Acquired immunity of plants. Treatment and prophylaxis of tumours of *Pelargonium zonale* induced by *Bacterium tumefaciens*.]—*Bull. Biol. Méd. exp. U.R.S.S.*, i, 5, pp. 387-388, 1936.

Details are given of experiments at the Moscow Institute of Microbiology in the therapeutic treatment of the tumours induced by *Bacterium tumefaciens* in *Pelargonium zonale* [*R.A.M.*, xvi, p. 303] by

repeated injections of (a) immune serum from rabbits (1:5), (b) vaccine prepared from an emulsion of the organism heated at 70° [C.] for an hour and then subjected to alternate freezing and thawing to destroy the bacterial cells, and (c) bacteriophage obtained by filtration of a 24-hour-old culture containing 0.25 per cent. sodium chloride. All the methods completely cured the crown gall, the tumours gradually shrivelling and dying in sharp contrast to the continued turgescence of the controls inoculated with pure cultures of *Bact. tumefaciens* and left without further treatment. Normal rabbit serum was much less effective, a slow cure being registered in 5 per cent. only of the test plants.

KRAUS (E. J.), BROWN (NELLIE A.), & HAMNER (K. C.). **Histological reactions of Bean plants to indoleacetic acid.**—*Bot. Gaz.*, xcviii, 2, pp. 370–420, 33 figs., 1937.

In this study it is shown that the histological responses of Red Kidney bean (*Phaseolus vulgaris*) cells to applications of indoleacetic acid in lanoline (30 mg per gm.) closely resemble those associated with crown gall (*Bacterium tumefaciens*) [*R.A.M.*, xv, p. 782], structures with the same appearance as tumour strands having been produced by the treatment [see next abstract].

SOLACOLU (T.) & CONSTANTINESCO (D.). **Tumeurs à caractères néoplastiques formées sur les plantes par l'action de l'acide β -indolyl-acétique.** [Tumours with neoplastic characters formed on plants by the action of β -indoleacetic acid.]—*C.R. Acad. Sci., Paris*, cciv, 4, pp. 290–292, 1 fig., 1937.

Previous experiments (*C.R. Acad. Sci., Paris*, cciii, p. 437, 1936) having shown that the application of a dilute solution of β -indoleacetic acid to bean (*Phaseolus vulgaris*) seedlings results in tumour formation [see preceding abstract], similar tests were carried out with the same compound (0.10 per cent. during the first 5 days, 0.20 per cent. thereafter) in glass tubes inserted into *Abutilon avicennae*, *Ricinus communis*, and *Helianthus annuus*, the area surrounding the site of penetration at the internodes being covered with a thin layer of indoleacetic acid paste. The resultant tumours were neoplastic in character and the cambium contained giant cells.

CHANG-TSI (W.). **Second year's report on the geographic distribution of cereal smuts in China.**—*Spec. Publ. nat. agric. Res. Bur. Minist. Ind., China*, 15, 35 pp., 2 figs., 1 map, 1936. [Chinese, with English summary.]

Most of the information here presented on the geographical distribution of cereal smuts in China has already been noticed from another source [*R.A.M.*, xvi, p. 159].

TAYLOR (E. M.) & HOWATT (J. L.). **Magnesium in field crop production in New Brunswick.**—*Sci. Agric.*, xvii, 5, pp. 294–298, 2 figs., 1937. [French summary.]

In recent years grain crops in the Saint John River Valley area of New Brunswick have turned yellow shortly after coming up, grown

slowly, and produced small yields as a result of low available magnesium. In two out of three fields of oats treated with applications to the soil or to the plants of a spray of magnesium sulphate at rates varying from 60 to 100 lb. per acre, an increased yield was obtained, the treated area in one field yielding 44 bush. per acre, as against only 20 bush. for the untreated area. The same treatment, as a spray, in one instance increased the yield of potatoes [*R.A.M.*, xv, p. 253] by 69 barrels an acre.

KÜDERLING (O. E.). **Untersuchungen über die Feldresistenz einzelner Weizensorten gegen *Puccinia glumarum tritici*.** [Investigations on the field resistance of individual Wheat varieties to *Puccinia glumarum tritici*.]—*Z. Zücht.*, A, xxi, 1, pp. 1-40, 3 figs., 12 diags., 1936.

A comprehensive, fully tabulated account is given of the writer's investigations on the reaction to six physiologic forms (German and foreign) of *Puccinia glumarum tritici* of a selection of winter and summer wheats [*R.A.M.*, xvi, p. 162] under greenhouse and field conditions.

The results of a series of greenhouse tests in which the plants were (a) maintained at constant temperatures of 10°, 15°, 20°, and 15° to 18° C., and (b) subjected to alternations (six days at 15° and thenceforth at 25° and vice versa) indicated that, with the latter method, the final temperature is decisive for the extent of rust injury, whereas under the former conditions certain varieties suffer most at the lower temperature range. The various physiologic forms were found to differ in their capacity for infection at low and high temperatures, the Danzig strain, for instance, which is normally most severe on Rouge prolifique barbu and Carsten V in hot weather also being distinctly aggressive at 10° and 15°, while Kitzeberg 31/2 and 32 adapt themselves to the tendency of the particular variety concerned.

The outcome of experiments designed to gauge the reaction of the wheats at various stages of growth to the physiologic forms under observation showed that Ridit and Blé Aurore are highly susceptible only in the seedling stage to Kitzeberg 31/2 and 32 strains but are liable to attack even at maturity by the Langenstein. These two varieties, like Michigan Bronze and Heine II, are practically unaffected by temperature changes. The reactions of Garnet are in general similar to those of Ridit and Blé Aurore, except that it is only moderately susceptible in the seedling stage and is not attacked by the Langenstein strain. At no stage in their development do Hörning's Dickkopf and Normandie show any inherent resistance to yellow rust, the incidence of which in these varieties is almost entirely governed by temperature relations, the latter being absolutely, and the former somewhat, resistant at 10°. Carsten V is subject to severe injury by the Kitzeberg 32 strain at all ages and temperatures, but with advancing maturity it acquires a marked degree of resistance to 31/2, except at high temperatures, while infection by the Langenstein strain is more severe at the lower ranges.

The results of the field experiments, notwithstanding some anomalies, generally confirmed those of the greenhouse trials. Blé Aurore was fairly, resistant to the Alnarp [Sweden], Danzig, and Guesny (Caucasus)

strains of the rust, but its reactions to the Kitzeberg forms were not in agreement with those of the greenhouse tests. The Langenstein form showed a remarkable capacity for attacking this variety even as late as July and was in general most aggressive with rising summer temperatures. Marquillo and Garnet were highly resistant to all physiologic forms in the field, and the latter even withstood artificial infection by the virulent Langenstein strain. Heine II, susceptible to all forms in the seedling stage, acquired a certain amount of resistance in the field, especially towards Kitzeberg 31/2. Normandie manifested strong physiological resistance towards all forms of *P. glumarum* except Langenstein, though its tendency (shared to a lesser extent by von Rümker's Sommerdickkopf) to contract infection at low temperatures was expressed in a certain susceptibility to the Alnarp, Danzig, and Grosny strains. Hörning's Dickkopf was susceptible throughout the trials.

Further details are given of the interrelations between the physiologic forms and their hosts at various stages and under diverse environmental conditions, and the paper concludes with a general discussion of the experimental results, in which the author emphasizes the fact that the complex of external and internal factors is responsible for the symptoms manifested. A bibliography of 86 titles is appended.

STRAIB (W.). **The occurrence and distribution of physiological races of yellow rust.**—*Res. & Progr., Berl.*, iii, 1, pp. 38-42, 1937.

The available information as to the occurrence, distribution, and relative virulence on different hosts of the 38 physiologic forms of yellow rust of wheat (*Puccinia glumarum*) is summarized and briefly discussed. Eighteen of these forms are stated to be of importance in Germany [see preceding abstract] and adjacent countries, form 7 being the most widespread. In the writer's opinion this disease is the most dangerous of all the rusts affecting wheat in western and central Europe, and of recent years in the La Plata States of South America [*ibid.*, xiv, p. 500].

RAJSKI (E.). **Rozpowszechnienie i rasy biologiczne rdzy brunatnej Pszenicy *Puccinia triticina* Erikss. w Polsce.** [The distribution and physiologic forms of brown rust of Wheat (*Puccinia triticina* Erikss.) in Poland.]—*Roczn. Nauk rol., Poznań*, xxxviii, 1, pp. 112-133, 1 col. pl., 1 map, 1937. [German summary.]

Brown rust of wheat (*Puccinia triticina*) is stated to be very prevalent and destructive in south Poland [*R.A.M.*, iv, p. 314], where it presumably overwinters in the form of uredo mycelium, no alternate host having been observed. Five physiologic forms of the rust [*ibid.*, xvi, p. 163] have been differentiated, of which XIII and XX are the most prevalent, XXI of common occurrence, and XVIII and XXIV very rare. None of the native winter and summer wheats or of some 300 foreign varieties used in two years' experiments displayed any marked degree of resistance to the Polish forms of *P. triticina*. The only practicable solution of the problem would appear to lie in the development of resistant strains from 28-chromosome and foreign wheats.

JABLOKOVA [YABLOKOVA] (Mme V. A.). Метод витальной окраски при определении жизнеспособности спор и мицелия *Ustilago tritici* *in vitro*. [Determination of the viability of the spores and mycelium of *Ustilago tritici* *in vitro* by the vital staining method.]—*Pl. Prot. Leningr.*, 1936, 11, pp. 68-71, 2 figs., 1936.

The author states that the viability of the mycelium, spores, and chlamydospores of loose smut of wheat (*Ustilago tritici*) can be rapidly determined *in vitro* by staining with 0.003 per cent. neutral red: in living cells the granules are stained red in three to five minutes, while in dead cells the whole protoplasm assumes a diffuse pink colour. The same method was also shown to apply for the differentiation of living or dead cells of *Fusarium buharicum*.

FELLOWS (H.). Nitrogen utilization by *Ophiobolus graminis*.—*J. agric. Res.*, liii, 10, pp. 765-769, 1936 (issued 1937).

The results of the experiments discussed in this paper showed that in a Czapek's modified nutrient solution, of the 15 inorganic and 35 organic chemical compounds tested, egg albumen, casein, peptone, and nucleic acid alone could be used as sources of nitrogen by *Ophiobolus graminis*, the take-all fungus of wheat. The unavailability of the other substances was not affected by the hydrogen-ion concentration of the medium, by the source of carbon, or by the addition of inorganic or organic growth-promoting materials. The fungus was found to grow well in many plant decoctions, and on the tissues of a number of different plants, the nitrogen consumed probably being derived from protein. It was also shown that a species of *Rhizopus* and one of *Penicillium* were also specific, in certain cases, as to the kind of nitrogen they could utilize, but many more compounds were available to them than to *O. graminis*.

WALDRON (L. R.). Influence of black point disease, seed treatment, and origin of seed on stand and yield of hard red spring Wheat.—*J. agric. Res.*, liii, 10, pp. 781-788, 1936 (issued 1937).

Comparative field experiments in 1934 in North Dakota showed that plants raised from seed of two wheat varieties (Ceres and a composite lot of three hybrid selections of the F_2 seed of the cross Ceres \times (Hope \times Florence)) affected with black point, almost entirely caused by *Helminthosporium sativum* and *Alternaria* sp. [*R.A.M.*, xvi, p. 231], did not appreciably differ in yield and other characters, except for a slight variation in seedling stands, from those produced by healthy seed of the same varieties. Treatment before sowing of the diseased seeds with new improved ceresan had no apparent effect either on yield or the other characters of the ensuing crop. Artificial infection of the seed with bunt [*Tilletia foetens*] significantly reduced the yield in every case, the reduction being practically the same in the progeny of the black-pointed as in that of the healthy seed.

BAYLES (B. B.). Influence of environment during maturation on the disease reaction and yield of Wheat and Barley.—*J. agric. Res.*, liii, 10, pp. 717-748, 6 graphs, 1936 (issued 1937).

A tabulated account is given of experiments in 1930 and 1931, in

which seed of four spring wheat and three spring barley varieties grown during the two preceding years, respectively, at several experimental stations in the United States and Canada were tested for reaction to seedling blight (*Gibberella saubinetii*) in the greenhouse at Madison, Wisconsin, and the wheat varieties for reaction to bunt (*Tilletia levis*) [*T. foetens*] (and also for yield) in the field at Madison, Moccasin (Montana), and Aberdeen (Idaho). The results showed that resistance to seedling blight was affected by the environmental conditions prevailing in the localities where the seed was produced; for wheat the average resistance index varied in 1929 from 45.3 for seed produced at Madison, to 14.8 for that from Mandan, North Dakota, and for barley from 77.6 for seed from Madison to 53.9 for that from Moccasin, Montana. It would seem that seed from some localities may be on the average more resistant over a period of years than seed from other localities, but that in any one year the relative disease reaction of the varieties may be reversed. The differences in reaction to seedling blight were greater between seed of the same variety produced under different environmental conditions than those between varieties from seed produced at the same station. A relationship was found between low protein in the seed and high resistance, and in some cases between large seed and high resistance, but these factors did not account for all differences, the results suggesting that differences of a nutritional or biochemical nature are more important than differences in morphology or size in the embryo and endosperm.

Reaction to bunt was also affected by the environmental conditions under which wheat seed was produced, but to a lesser degree than that to seedling blight; only one of the 76 seed lots tested differed significantly from other seed lots of the same variety. A small correlation (-0.3036 , $P=0.01$) was found between size of seed and reaction to bunt, the larger seed producing a lower percentage of bunted plants.

On general lines, these results are considered to emphasize the necessity of carefully selecting seed for testing varietal resistance to disease.

CROSIER (W. F.). **Procedure used in an analytical and mycological study of seed Wheat.**—*Proc. Ass. Off. Seed Anal. N. Amer.*, 1936, pp. 89-91, 1 fig., 1936.

Among the eight factors for the evaluation of wheat seed the author includes the presence of disease organisms and describes a procedure for determining this factor. From samples of wheat seed 15 gm. portions were removed with a flamed spoon and dropped into flasks of distilled water. While the adhering fungus spores were being loosened from the seeds, the remainder of the samples were sieved and the unbroken bunt balls (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*, respectively], *Fusarium*-discoloured seeds, and ergots [*Claviceps*] were determined per pound of seed. The flasks were then agitated and the aqueous suspensions of the spores present poured into centrifuge tubes. Concentration of the spores was effected by centrifuging at 2100 R.P.M. for three to five minutes and the supernatant liquid was extracted from each until exactly 2 c.c. remained. The concentrates

were then shaken and a drop (0.01 c.c.) was removed with a pipette and placed on a slide for microscopical examination. In a typical sample of wheat seed 27 bunt balls, 2 ergots, and a trace of scabby seeds were present per pound of seed, the number of spores found being as follows: *Alternaria* 97,000, *T. caries* and *T. foetens* 4,550,000, loose smut [*Ustilago tritici*] 575,000, the uredo stage of rust [*Puccinia* spp.] 85,000, and *Fusarium* sp. 239,000.

BIRAGHI (A.). **Ricerche sulla micoflora radicecola del Grano.** [Researches on the root-inhabiting mycoflora of Wheat.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 147–154, 1 pl., 1936.

An account is given of a preliminary study of the fungi found on the roots of wheat grown in numerous different localities in Italy in soils containing from 5 to 38 per cent. lime and ranging in P_H value from 5 to 8. Of approximately 200 fungi isolated the commonest was *Asterocystis radices* [*R.A.M.*, xv, p. 751], accompanied by Phycomycetoid mycelia and oospores of Peronosporales, generally in very great abundance. Only in a few instances were any vesicles or any ellipsoidal bodies observed in the cells, resembling those of Peyronel's Phycomycetoid endophyte [*ibid.*, xii, p. 309]. A few Deuteromycetes were noted, including very occasional records of *Fusarium* spp. and members of the Dematiaceae and the Mucedinaceae.

Referring in detail to the first group of cultures (from Mentana wheat grown at Alessandria in alluvial soil containing 14 per cent. lime, and of P_H 7.8), the author states that in addition to *A. radices* were found three species of Phycomycetes (O1, O4, and O10), two species of *Fusarium*, one species of *Trichoderma*, and two of the Dematiaceae.

The strain O1 showed on the sixth day abundant formation of oogonia usually borne terminally on lateral branches, and measuring 18 to 23 μ in diameter. The antheridial filament averaged 3 μ in diameter, was generally long, sometimes tortuous, and nearly always arose from a different hypha from that bearing the oogonium. The oospore, which did not completely fill the oogonium, measured 16 to 18 μ in diameter, with a wall averaging 1.8 μ thick and sometimes with one or two processes 4 to 12 by 2 to 3 μ , in old cultures. Conidia 20 to 40 (average 30) μ and zoosporangia with reniform zoospores were formed in culture. These characters suggest that the fungus is identical with *Fythyum polymorphon Sideris* [*ibid.*, xi, p. 546]. Further investigations are in progress.

TAPKE (V. F.). **A method of inoculating seed Barley with black loose smut for use in studies on physiologic races.**—*Phytopathology*, xxvii, 1, pp. 115–116, 1937.

The writer has devised a liquid method of inoculating seed barley with black loose smut (*Ustilago nigra*) [*R.A.M.*, xvi, p. 167] which is stated to obviate certain drawbacks incidental to the dusting procedure. Four diseased heads are immersed in 750 c.c. water in a 1 l. Erlenmeyer flask, which is vigorously shaken to loosen the spores. The spore suspension is transferred to another vessel through a fine screen to remove extraneous matter and poured over small lots of seed in shell vials until the fluid rises about $\frac{3}{4}$ in. above the grain, which is then

vigorously shaken for $\frac{1}{2}$ min. and allowed to soak for 15. The suspension is then decanted and the vials inverted on blotting paper. The vials of moistened, inoculated seed are placed, uncorked, in a moist atmosphere for 24 hours at 18 to 20° C. The seed is finally transferred to small, open envelopes and left until dry enough for sowing. In the autumn of 1935 a field planting of 25 barley varieties was inoculated by this method in North Carolina, and in the following spring, notwithstanding severe winter conditions, a maximum of 83 per cent. infection was registered.

TIDD (J. S.). **Studies concerning the reaction of Barley to two undescribed physiologic races of Barley mildew, *Erysiphe graminis hordei* Marchal.**—*Phytopathology*, xxvii, 1, pp. 51–67, 2 figs., 1937.

The reactions of 85 barley varieties in the seedling stage to greenhouse inoculation experiments with two new physiologic forms, 6 and 7, of barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, ix, p. 370; xv, p. 568] are described. Heil's Hanna 3 C.I. 682 was added to the list of four differential varieties used in Mains's and Dietz's investigations.

Five wild species of *Hordeum*, viz., *H. murinum*, *H. gussoneanum*, *H. nodosum*, *H. pusillum*, and *H. jubatum*, proved highly resistant to form 6 in winter tests in the greenhouse. Seedling barley plants showed no marked seasonal differences in their reaction to forms 6 and 7 of *E. graminis hordei*, though certain varieties tended to be slightly more resistant in the spring, at which time also adult plants withstand the disease better than seedlings of the same varieties.

Studies of the F_2 and F_3 progeny of three crosses between resistant and susceptible plants indicate that resistance or susceptibility to form 6 of barley mildew in the seedling stage is inherited in definite Mendelian proportions. In all the crosses—Svansota M. 786 \times Hanna C.I. 906, Featherston C.I. 1118 \times Goldfire C.I. 928, and Arequipa C.I. 1256 \times Horsford C.I. 610—a single pair of factors is involved, but in the two first resistance is only partially dominant while in the third it is completely so.

STAKMAN (E. C.). **Variation in *Ustilago zeae*.**—*Science*, N.S., lxxxv, 2193, pp. 58–59, 1937.

The author states that the maize smut *Ustilago zeae* comprises an indefinite number of strains or lines, and in his and his collaborators' studies [*R.A.M.*, xiii, p. 226] the fungus proved to be especially suitable for investigations on heritable variations, because of the constancy of the vegetatively propagated unicellular, unisexual individuals on nutrient media, giving rise to unisexual lines, within which all the individuals, barring mutations, have the same heritable properties. Innumerable new lines, however, may be produced either by mutation in the original lines or by hybridization between two unisexual lines. As demonstrated by extensive studies, the new lines differ from one another in one or more characters, such as type of growth, colour, size, and topography of the colonies, sex and parasitism, and tendency to mutate. Several hundred mutant lines were studied and though some were found to be conspicuously different from each other, others differed in almost imperceptible but distinctive characters. It was

shown that the factors for the new mutant characters are inherited when mutant lines are crossed with lines of opposite sex, and the tendency to mutate is due to heritable factors and differs greatly in different lines. Segregates from crosses between mutable and constant lines were either very mutable, moderately mutable, or constant, and by crossing the most mutable lines with one another for several generations, material was obtained in which all segregates are extremely mutable. [The subject matter of this note was discussed in some detail in the author's recent publication already briefly noticed: *ibid.*, xvi, p. 48].

SASS (J. E.). **Histological and cytological studies of ethyl mercury phosphate poisoning in Corn seedlings.**—*Phytopathology*, xxvii, 1, pp. 95–99, 2 figs., 1937.

An anatomical study was made of the hypertrophy induced in yellow dent maize seedlings by 24 hours' immersion in 1 in 1,500 new improved ceresan (ethyl mercury phosphate) [*R.A.M.*, xvi, p. 162]. The leaf primordia undergo extensive thickening and develop irregular crenations and lobes, and both in these organs and in the apical meristem of the plumule cell division is inhibited and extreme enlargement of the existing cells takes place [cf. *ibid.*, xiii, p. 624]. The cells of the hypertrophied organs become multinucleate, containing nuclei ranging from minute 'micronuclei' to polyploid 'giant nuclei' the number of chromosomes in which may exceed 200.

VAHEEDUDDIN (S.). **Observations and experiments on diseases of plants in Hyderabad State, India.**—*Proc. Minn. Acad. Sci.*, iv (1937), pp. 47–50, 1 fig., 1937.

Following some observations on certain diseases of important crops in Hyderabad State, India, with special reference to the sorghum smuts caused by *Sphacelotheca sorghi*, *S. cruenta*, and *Sorosporium relianum*, the writer describes experiments conducted at St. Paul, Minnesota, to determine the possibility of hybridization between the two last-named species [*R.A.M.*, xiv, p. 504]. Monosporidial lines of each of the smuts, isolated from the promycelia of germinating chlamydospores, were cultured for a week on potato dextrose broth and five were injected hypodermically, both singly and in paired combinations, into five-week-old sorghum seedlings. None of the single lines caused infection, but foliar chlorosis was induced in 8 to 12 days by 11 out of 18 of the pairs. Long sori developed in the inflorescences of the diseased plants. The hybrid chlamydospores are echinulate like those of *S. reilianum* and intermediate in size (8.8μ) between the two parents. The promycelia and sporidia are significantly larger (79 and 12.7μ in length, respectively) than those of either parent. Monosporidial lines isolated from the hybrid chlamydospores and inoculated singly and in different paired combinations into sorghum plants produced foliar chlorosis and sori in the inflorescences. Back-cross trials of the hybrid with both parental lines showed the former to be capable of uniting with either of the latter and infecting the host. This intergeneric hybrid gave evidence of the vigour normally associated with crosses among higher plants, and it is thought that many new smut types and physiologic forms owe their inception to spontaneous hybridization in nature.

POWELL (H. C.) & MATHEWS (I.). **The use of zinc sulfate in controlling mottle leaf of Citrus trees.**—[*Publ.*] *Univ. Pretoria*, Ser. i, 35, 4 pp., 1936. [Abs. in *Chem. Abstr.*, xxxi, 3, p. 199, 1937.]

In this further account of the control of citrus mottle leaf [*R.A.M.*, xiv, p. 753; xvi, p. 93] in the Sundays River Valley, Pretoria, it is stated that the application to the soil round bearing trees of 8 lb. zinc sulphate gave good results but in some cases caused damage to the trees. Spraying with zinc sulphate and hydrated lime (10–5–100) with 8 to 10 oz. spreader restored diseased trees to a normal state of health and vigour in a few months, but the trees should not be sprayed less than two months before picking, since the compound leaves a temporary white residue on the fruit that resists washing or brushing. The beneficial effects of the zinc sulphate treatment appear to persist for at least two years. Mottle leaf of grapefruit was combated by treatment with a mixture of 3.33 lb. zinc oxide and 100 galls. water, but some burning of the young fruit occurred.

NYENHUIS (E. M.). **Attempts to control Citrus concentric ring blotch.**—*Fmg S. Afr.*, xi, 127, p. 424, 1936.

Negative results in the control of concentric ring blotch on Bailedge Early Orange nursery trees budded on rough lemon stocks [*R.A.M.*, xiv, p. 679] were given by spraying with 0.4 per cent. solutions of iron, calcium, copper, manganese, magnesium, potassium, ammonium, and zinc sulphates and superphosphate.

FRITZ (A.). **Les taches des grains de Café.** [The spots of Coffee beans.]—*Ann. agric. Afr. occ.*, i, 1, pp. 99–109, 1937.

In San Salvador [Central America] coffee cherries are liable to infection by *Omphalia flavida* [*R.A.M.*, xvi, p. 314] at all stages of growth, but particularly until they reach two-thirds of their full size, since the mature tissues are insufficiently acid (P_H 7.3 to 7.5) to favour the fungus, which grows best at P_H 4.8 to 5. Affected young fruits at once turn black, but generally remain attached to the trees. The chief losses are sustained when the fruits are 4 to 5 months old; when these are attacked they become a total loss, the fungus causing the fruits to wither up, and to turn livid yellow, streaked with pink, then light brown, gradually darkening. Whether these fruits fall or not, they constitute serious infection centres. Only one or two spots are present on the outside of each fruit; often one is 6 to 8 mm. and the other 1 to 2 mm. in diameter. The spots are well-defined and slightly depressed, and the affected tissues often crack and fall. On ripening fruits the fungus develops more slowly, most of the fruits reaching maturity without wrinkling or spotting, and in some cases appearing quite normal.

After depulping berries may show spots of the same shape and size as those seen on the fruits. Some of the berries from obviously infected fruits appear to be normal, but are not so, and the disease continues to develop right up to the time they are placed on sale. After processing the berries may show brown to black or bluish spots.

Brown eye spot (*Cercospora coffeicola*) [loc. cit.] may be present on the fruits as round spots 2 to 3 mm. in diameter, principally near the apex; these may enlarge, reaching 10 mm. in diameter, or they may

be irregular, rectilinear, and confluent. Affected fruits rapidly wither, at least on one side, and show the presence of black blotches. Green fruits are those most liable to attack. The berries show white or blue spots.

ROGER (L.). **La rouille du Caféier au Cameroun (*Hemileia coffeicola* Maublanc et Roger).** [Coffee rust in the Cameroons (*Hemileia coffeicola* Maublanc & Roger).]—*Ann. agric. Afr. occ.*, i, 1, pp. 92–98, 1 pl., 5 figs., 1937.

In this full account of the coffee rust recently reported from the Cameroons as due to *Hemileia coffeicola* [*R.A.M.*, xiv, p. 303] the following points may be noted. The upper surfaces of diseased leaves long remain green, before finally yellowing, though a few leaves dry up and turn brown at once. The branches near the ground are those most affected and in serious outbreaks complete defoliation may occur.

The mycelium in the leaf is characterized by the large diameter of the hyphae which swell as they pass from the mesophyll towards the substomatal chamber, the diameter increasing from 6 to 8 μ up to 30 μ . The haustoria are localized chiefly in the upper mesophyll and occur as voluminous, irregularly lobate masses, almost completely filling the cell.

The areas at present infected are either unfavourable to the cultivation of *Coffea arabica* or have an excessively long wet season, this period always coinciding with a recrudescence of the disease, which is favoured by over-luxuriant foliage, maintaining an excessive humidity, over-production, weakening the trees, and high soil and atmospheric humidity. Control consists in adequate pruning, pinching off the flowers in cases of over-production, and spraying during the rainy season with freshly made neutral, casein Bordeaux mixture applied preventively at a strength of 1.5 per cent. at the end of the dry season and once or twice later on at a strength of 2 per cent. The disease has been found at Dschang, Foumban, and Abong M'Bang, its presence in the last-named locality indicating a very extensive and alarming spread eastwards.

CASTELLANI (E.). **La ruggine del Caffè (*Hemileia vastatrix* B. e Br.).** [Coffee rust (*Hemileia vastatrix* B. et Br.).]—*Agricoltura colon.*, xxxi, 1, pp. 15–23; 2, pp. 66–72, figs., 1937.

After pointing out that coffee rust (*Hemileia vastatrix*) [*R.A.M.*, xvi, p. 154] has not yet been reported from Italian East Africa, the author gives a semi-popular account based on a study of the literature of the geographical distribution, symptoms, morphology, predisposing conditions, and control of the disease.

DJELALOFF (R.). **Результаты опытов по гоммозу Хлопчатника в Сабир-Абадском районе АССР.** [Results of experiments on gummosis of Cotton in the Sabir-Abad region of Azerbaijan.]—*Publ. Азербайдж. научно-исслед. хлопков. Инст. АзНИИХИ* [*Azerbaijan Cotton sci. Res. Inst. AzNIKHI*], Kirovabad, Sci. Ser., 14, 33 pp., 2 diags., 5 graphs, 1936. [English summary.]

A very fully tabulated account is given of experiments in 1934 in

Azerbaijan [Transcaucasia] on the control of *Bacterium malvacearum* on cotton [*R.A.M.*, xvi, p. 249]. Steeping non-delinted cotton seed for 5 minutes in 1 in 100 formalin and covering it with tarpaulins for two hours reduced the incidence of the black arm symptoms from 27.0 per cent. in the control to 15.5 per cent., compared with 22.1 per cent. for treatment with sulphuric acid (1.7 to 1.8 sp.g. for 15 min.), and the incidence of angular leaf symptoms from 26.3 to 18.1 and 21.1 per cent., respectively, the corresponding index figures for intensity of infection (scale 0, 0.1, 1, 2, 3, and 4) being 7.3, 3.3, 5.5, 2.7, 1.5, and 1.4, respectively. Sulphuric acid treatment accelerated somewhat the germination of the cotton seed and apparently stimulated the vigour of the young seedlings, but this effect wore off as the season advanced.

Field observations showed that infection with *Bact. malvacearum* was greater on soils sown to cotton for three consecutive years, indicating that the organism survives the winter under local conditions. In plots sown on 22nd March the incidence of black arm was 26.6 per cent. and of angular leaf spot 10.8 per cent., as against 55.2 and 36.8 per cent., respectively, in plots sown from the middle of April onwards. The intensity of black arm was shown to be directly related to the severity of the crop losses, the actual figures given being 7.7 per cent. total loss in plants with lesions not girdling the stems, 31.5 per cent. in plants with lesions girdling the stems, 53.3 in plants with stunted or deformed stems, and 82.6 per cent. in plants with entirely or partly broken but still living stems.

KRUG (H. P.). Segunda contribuição para a distribuição geographica da murcha do Algodeiro (*Fusarium vasinfectum*) no Brasil. [Second contribution to the geographical distribution of Cotton wilt (*Fusarium vasinfectum*) in Brazil.]-*Circ. Inst. agron. Campinas* 5, 2 pp., 1937. [English summary.]

Fusarium vasinfectum was first recognized in Brazil on cotton from the Textile Plant Experiment Station, Alagoinha, Parahyba, and reported to a meeting of Brazilian phytopathologists in January, 1936. In December of the same year the fungus was isolated in pure culture from plants growing near Recife, Pernambuco, and its pathogenicity established by inoculation experiments. It is suspected that the organism is present in most of the cotton-growing regions of north-eastern Brazil.

LÉGER (L.) & GAUTHIER (MARCELLE). Graminella bulbosa nouveau genre d'entophyte parasite des larves d'Ephémérides du genre Bactis. [*Graminella bulbosa*, a new genus of entophyte parasite on the larvae of Ephemeridae of the genus *Bactis*.]-*C.R. Acad. Sci., Paris*, cciv, 1, pp. 27-29, 5 figs., 1937.

Graminella bulbosa n.g., n.sp., found parasitizing *Bactis rhodani* larvae, to the rectal cuticle of which it is attached by means of bulbous 'feet', in streams in the vicinity of Grenoble, is a member of the Harpellaceae [cf. *R.A.M.*, xv, p. 649]. It is characterized by a main axis, 500 to 600 μ long, from which proceed erect branches terminating in a few slender 'ears', 100 to 120 μ in length, of up to 20 densely aggregated unilateral, ovoid, elongated spores, 12 to 15 by 3 μ , furnished

with a single caudal appendage up to 70μ in length. Reproduction is effected by means of budding from the basal cells. There may be as many as 30 or 40 of these 'arbuscles' attached to a single host, the whole presenting the aspect of minute wheat sheaves with the ripe ears turned outwards.

WITTICH (F. W.) & STAKMAN (E. C.). **Case of respiratory allergy due to inhalation of grain smuts.**—*J. Allergy*, viii, 2, pp. 189–193, 2 figs., 1937.

The sputum of a 48-year-old man working in the milling district of Minneapolis and suffering for over 20 years from asthma was found to contain spores of *Ustilago zeae*, of a smooth-spored species of *Ustilago*, and of *Tilletia levis* [*T. foetens*], and he reacted positively to scratch and puncture tests with extracts of *T. tritici* [*T. caries*], *T. foetens*, *U. tritici*, *U. hordei*, *U. nuda*, *U. avenae*, *U. crameri*, *U. zeae*, *Urocystis occulta*, *Sphacelotheca sorghi*, *S. cruenta*, and *P. graminis tritici* [*R.A.M.*, xii, p. 174], the most pronounced effects being due to *T. caries*, *T. foetens*, *Ustilago zeae*, and *S. sorghi*.

It would appear from these and other observations in cereal-growing areas that smuts may be equally important with the commoner moulds in the etiology of respiratory allergy and frequently augment the susceptibility of grain-sensitive patients. During the last few years, periods of drought, low humidity, and high winds have combined to render the spore content of the air abnormally high. During the rust epidemic of 1935, for instance [*ibid.*, xvi, p. 25], as many as 980,000 per sq. ft. were deposited a few feet above the ground during a 24-hour period, and the number sometimes reached 1,000,000.

MARTIN (D. S.), JONES (C. P.), YAO (K. F.), & LEE (L. R.). **Classification of the genus *Monilia*.**—Abs. in *J. Bact.*, xxxiii, 1, pp. 28–29, 1937.

Over 150 strains of *Monilia* [*Candida*] [*R.A.M.*, xvi, p. 177] from human sources were studied in comparison with strains supplied by [Rhoda W.] Benham, Stovall, Langeron, Castellani, and others. Colony formation on blood agar, growth type on glucose broth, carbohydrate fermentation, microscopic morphology on maize meal agar, and serological properties were sufficiently clearly correlated to classify the fungi under observation into six well-defined groups. Consistent results with sugar fermentations were obtainable only after a given organism had been passed through several generations on sugar-free media. It was further found essential to cover the inoculated carbohydrate broth with a vaseline seal. Agglutinations with immune sera were of some value in confirming the separation of these fungi into groups, but the antigenic relationships are so close as to preclude the use of this method for diagnostic procedure.

PINKERTON (ELIZABETH). **Dissociation in *Monilia*.**—Abs. in *J. Bact.*, xxxiii, 1, p. 117, 1937.

Comparative morphological studies were conducted on 50 strains of *Monilia* [*Candida*] from various pathological conditions in human patients [see preceding and next abstracts], and on the basis of giant

colony formation, six types were recognized which appeared to agree fairly well in other characters. Representatives of the four main types were carried through several generations by means of loop transfers. The giant colony characters varied noticeably in most cases, though a few stable strains were encountered. In one variable strain followed through four generations, all the progeny were segregated into four sub-types consisting of one main group around which the others varied with a normal curve distribution. In the same strain plate colonies were examined after 48 hours for S, R, and r varieties, of which the first were common and unstable, the second infrequent and stable, and the third intermediate in both respects. All three types were secured from single giant colonies in some cases.

SCHWARTING (VIRGINIA). **Occurrence of *Monilias* in tuberculosis sputum.**—Abs. in *J. Bact.*, xxxiii, 1, p. 117, 1937.

Strains of *Monilia* [*Candida*: see preceding and next abstracts] were isolated from 19.6 per cent. of the sputa of tuberculous patients [cf. *R.A.M.*, xvi, p. 254] in a series of 500 cultures. Of the total number of strains secured, 65.3 per cent. originated in persons with advanced lesions, 24 per cent. from moderately severe cases, and only 10 per cent. from mildly affected patients, while in a series of 100 up-grade individuals only 7 were positive for the presence of *Candida* in the sputum. It is thus apparent that the extent of tuberculosis in the lungs influences the incidence of fungal infection in the sputum, though the manner in which the connexion operates is not entirely clear. Less than half (about 43.4 per cent.) the strains in a series of 23 studied were pathogenic to mice.

TODD (RAMONA L.). **Studies on yeast-like organisms isolated from the mouths and throats of normal persons.**—*J. Bact.*, xxxiii, 1, pp. 117–118, 1937.

Of 1,000 normal persons examined for the mycological flora of the mouth and throat at the Minnesota Department of Health, 14.7 per cent. harboured yeast-like fungi and in 14 per cent. *Monilia* [*Candida*] *albicans* was present [see preceding abstracts]. In 7 per cent. the fungus occurred in both mouth and throat, in 3.1 per cent. in the mouth only, and in 3.9 per cent. in the throat only. The incidence of the fungus was higher in females (18.2 per cent. of 527) than in males (9.3 per cent. of 473).

In tests with human sera, agglutinins of *C. albicans* were found to be present in the sera of 30.4 per cent. of 533 females and in those of 15.7 per cent. of 617 males. Some relationship would thus appear to be indicated between a high titre of agglutinins in the serum and the presence of *C. albicans* in the mouth and throat of a given individual. [An expanded account of this work is given in *Amer. J. Hyg.*, xxv, 2, pp. 212–220, 1937.]

CATANEI (A.) & HIGOUMENAKIS (G.). **Sur les teignes humaines observées en Grèce.** [On the human ringworms observed in Greece.]—*Bull. Soc. Path. exot.*, xxx, 1, pp. 6–8, 1937.

Twenty-two cases of trichophytosis of the scalp examined at Athens

in the course of the first systematic study of Greek dermatomycoses yielded 18 pure cultures of *Trichophyton*, viz., 15 of *T. violaceum* [*R.A.M.*, xvi, p. 317], 2 with smooth colonies (one new species and a new variety of *T. glabrum* to be described in a forthcoming paper), and 1 of *T. plicatile* [*ibid.*, xv, p. 218]. Eleven of the 12 cultures obtained from 13 cases of microsporiasis of the scalp were identified as *Microsporon canis* (*M. felineum*) [*ibid.*, xvi, p. 317] while one approximated to *M. equinum* [*ibid.*, xv, p. 580]. From 14 cutaneous lesions 7 cultures were obtained, 4 of *M. felineum* and 3 of *T. violaceum*.

DE CISNEROS (J. M. G. J.). **El cultivo de los dermatomycetos sobre medios naturales, vegetales y animales.** [The cultivation of the dermatomycetes on natural vegetable and animal media.]—*Med. Paises cálidos*, ix, 1, pp. 1-15; 2, pp. 49-74, 10 figs., 1936.

Wheat or oat grains, and wheat flour, starch, and dextrin agar constituted less suitable media for 15 strains of dermatophytes used in the author's studies than the standard nutrient substrata [cf. *R.A.M.*, xv, p. 721]. Twenty species of *Epidermophyton*, *Microsporon*, *Achorion*, and *Trichophyton*, however, made excellent growth on human or animal (sheep) cerebral pulp, which retarded pleomorphism in the initial stages but was powerless to restore the original characters in cases where this process had reached an advanced phase.

SCHMIDT (P. W.) & MARQUARDT (U.). **Ueber den antimykotischen Effekt ätherischer Öle von Lauchgewächsen und Kreuzblütlern auf pathogene Hautpilze.** [On the antimycotic effect of the volatile oils of Alliaceae and Cruciferae on pathogenic skin fungi.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxviii, 1-2, pp. 104-128, 9 figs., 1936.

A detailed, tabulated account is given of experimental observations on the action on cultures of *Epidermophyton* [*Trichophyton*] *interdigitale*, a very important agent of human mycoses [*R.A.M.*, xvi, p. 253] in Germany, of pharmaceutical preparations of garlic, onion, and horseradish and extracts thereof, all of which retarded or inhibited the development of the fungus grown on Grütz's agar, owing to their minute content of volatile oils. The possible therapeutic applications of these drugs in cases of epidermal infection are briefly discussed.

LOCHTE (T.). **Über das Vorkommen der Piedra beim Schimpansen und über die Beziehungen der tierischen Piedra zur menschlichen.** [On the occurrence of piedra in the Chimpanzee and on the relations of animal to human piedra.]—*Arch. Derm. Syph.*, Berl., lxxv, 1, pp. 107-113, 7 figs., 1937.

A species of *Trichosporon*, probably *T. hortai* or *T. beigeli* [*R.A.M.*, xii, p. 444; xv, p. 20], characterized by mosaic-like cells, 3 to 6 μ in diameter, and asci (sporocysts) up to 32 μ in diameter, containing fusiform, slightly curved ascospores, was isolated from the hair of a young chimpanzee in the Munich zoological collection, and subsequently from six skins, all the material originating in the Cameroons. *T. hortai* is stated to be innocuous to human hair, whereas that of the chimpanzees was extensively disorganized by the *Trichosporon* under observation.

KAMBAYASHI (T.) & OTAKE (S.). **Über die Tierpathogenität pflanzen-pathogener Pilze, insbesondere von *Fusarium solani* (Mart. pr. p.) App. et Wr.** [On the pathogenicity to animals of plant-pathogenic fungi especially of *Fusarium solani* (Mart. pr. p.) App. & Wr.]—*Z. Parasitenk.*, viii, 5, pp. 611–616, 3 figs., 1936.

The cutaneous inoculation of *Fusarium solani* from onion [*R.A.M.*, xii, p. 135], *F. bulbigenum* var. *niveum* from watermelon [see above, p. 369], and *Gibberella fujikuroi* [ibid., xv, p. 173] and *G. saubinetii* from rice [ibid., xiv, p. 653] into guinea-pigs resulted in the development of erythema, pustule formation, and scaling, the symptoms being most severe in the case of the first-named and of very slight intensity in that of *G. fujikuroi*; all the fungi were reisolated from the sites of infection. The two species of *Fusarium* were further inoculated into the writers' arms with positive results, which were again more severe in the case of *F. solani*, and successfully reisolated.

BAKER (R. D.) & BRIAN (E. W.). **Blastomycosis of the heart.**—*Amer. J. Path.*, xiii, 1, pp. 139–147, 1937.

Blastomycosis of the heart was encountered at the autopsies of two cases (young negroes) of generalized infection with *Blastomyces* [*Endomyces*] *dermatitidis* [*R.A.M.*, xvi, p. 254]. Each showed diffuse pericardial blastomycosis, a large blastomycotic tubercle of the right atrial wall, and involvement of the corresponding endocardium, whence the organisms apparently entered the blood stream to produce the miliary pulmonary blastomycosis noted in both instances.

TAKAHASHI (Y.). **Zur Chromoblastomycose. (I. Mitteilung.) Über Chromoblastomycose, verursacht durch *Torula poikilospora* n.sp.** [First note on chromoblastomycosis. On chromoblastomycosis caused by *Torula poikilospora* n.sp.]—*Jap. J. Derm. Urol.*, xli, 1, pp. 31–43, 9 figs., 1937.

To the three known agents of chromoblastomycosis, namely, *Trichosporium* (*Acrotheca*) *pedrosoi*, *Phialophora verrucosa*, and *Hormiscium dermatitidis* [*R.A.M.*, xv, p. 502; xvi, p. 251], the writer adds a fourth, *Torula poikilospora* n.sp., responsible for an ulcerated condition of the left leg [the clinical aspects of which are fully described] in a 58-year-old Japanese peasant.

The fungus is characterized by olive-green hyphae, 1.5 to 4.5 μ in width, bearing laterally and terminally long, branched chains of very irregular, olive-green spores, 2 to 25 by 1.5 to 16 μ , together with normal spherical (2 to 9 μ), ellipsoid or oval (2.5 to 14 by 1.5 to 8 μ) elements. The spore chains consist mainly of arthrospores interspersed with budding forms; they do not readily fall apart. Double-walled, light brown to brownish-black chlamydospores develop in older cultures.

T. poikilospora made slow growth on Sabouraud's glucose agar and other media, forming greenish-black, compact colonies, with radial grooves extending from the raised centre to the periphery; the surface is covered with a brownish-grey down. The optimum temperature for growth is 37° C. Sugars were not fermented. The fungus was inoculated with positive results into the patient and laboratory animals.

TECCE (R.). À propos d'un blastomycète (*Cryptococcus uvae* Pollacci et Nannizzi) isolé d'après la langue de l'homme. [On a Blastomycete (*Cryptococcus uvae* Pollacci & Nannizzi) isolated from a human tongue.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 12, pp. 256–257, 1936.

A fungus isolated in a case of acute glossitis from a human tongue and stated by Pollacci to have the characters of *Cryptococcus uvae* [*R.A.M.*, x, p. 256] made vigorous growth in pure culture after 24 hours at 37° C. on Sabouraud's agar, the white, smooth, shining colonies measuring 1 to 2 mm. in diameter, and after 10 to 15 days developing indentations which became progressively more marked. The blastospores were round (2 to 7 μ in diameter) or oval (9 by 4 μ), had a double wall, and frequently budded. On potato the hyphae consisted of 2 to 3 segments, averaged 2 μ in diameter, and bore large aggregations of blastospores at their extremities. Unlike Gandini's strain [loc. cit.] the author's developed very poorly on plain agar, slowly on glycerine agar, and vigorously on Sabouraud glucose. In plain bouillon no superficial pellicle formed, though present on glycerine bouillon. The organism did not liquefy gelatine, coagulate milk, or ferment lactose, maltose, dulcitol, or mannitol, but fermented glucose, levulose, saccharose, and galactose. It was pathogenic to the rat, from the peritoneal fluid of which it was reisolated.

CIFERRI (R.) & REDAELLI (P.). Sur la probable situation systématique de *Bargellinia monospora* Borzi. [On the probable systematic position of *Bargellinia monospora* Borzi.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 12, pp. 260–263, 1936.

In discussing the systematic position of *Bargellinia monospora* isolated by Borzi in 1888 at Messina from cerumen, the authors state that Borzi's description of the fungus, assuming that the so-called ascus is a non-sexual form of reproduction, fits in exactly with their own description of *Sporendonema epizoum* [*R.A.M.*, xv, p. 580]. Furthermore, the description of the reproductive organs of *B. monospora* greatly resembles Vuillemin's description of the hemispores of *Hemispora stellata* [ibid., xv, p. 20], in the sense that Borzi's 'clubs', which are at first continuous, then septate, and finally differentiated into globose, brownish, verrucose spores, correspond to Vuillemin's ampulliform, vesiculous protoconidia; the latter must become septate to form the deuteroconidium, which finally becomes individualized into 'spherical, dark, verrucose hemispores'. This identification is confirmed indirectly by the fact that *S. epizoum* has been found several times in organic substrata or in air in Sicily. Further proof is that *S. epizoum* was first recorded (under the name *Torula rufescens* Fresenius) in a case of otitis in Germany in 1870 and was later isolated from another case of otitis by Ciferri in the Dominican Republic.

It is concluded that *B. monospora* is identical with *H. stellata*, *T. dagatae* [ibid., xiii, p. 701], and *S. epizoum*.

JONES (P. M.). A new species of *Microascus* with a *Scopulariopsis* stage.—*Mycologia*, xxviii, 6, pp. 503–509, 24 figs., 1936.

The author describes the cultural and cytological characters of a

fungus isolated in December, 1931, from an infection of the hands and forearm. On Sabouraud's media the growth was smooth and whitish, becoming greyish-mealy with the formation of conidia and turning black with the development of ascocarps; the growth also became wrinkled and raised above the surface of the agar. The perithecia developed abundantly in Knop's solution on slides; and the author has found this solution more satisfactory for dermatophytes than agar media. The conidial stage is regarded as a new species of *Scopulariopsis* which is named *S. lunaspora*, and the perithecial stage as a new species of *Microascus*, differing from *M. trigonosporus* and *M. sordidus* in its lunate spores, and is named *M. lunasporus* [both with diagnoses in English]. *S. lunaspora* is characterized by oval to lemon-shaped conidia with a collar at the base and measuring 4 to 7 by 2 to 4 μ , borne in chains directly on the mycelium, or on simple or branched conidiophores with sterigmata 5 to 12 μ long. The perithecial stage, *M. lunasporus*, is beaked with a papillate ostiole, carbonaceous, and 175 to 300 μ in diameter; the 8-spored, oval, deliquescent asci, 7 to 14 by 7 to 12 μ , are irregularly distributed and the lunate ascospores, 8 to 14 by 4 to 7 μ , are extruded in light reddish-brown cirrhi.

CALINISAN (M. R.) & HERNANDEZ (C. C.). **Studies on the control of Abacá bunchy-top with reference to varietal resistance.**—*Philipp. J. Agric.*, vii, 4, pp. 393–408, 3 pl., 1 fig., 1936 (issued 1937).

Further studies in Cavite, Philippine Islands, on the selection and propagation of abacá [*Musa textilis*] varieties highly resistant to bunchy top [*R.A.M.*, xv, p. 80] and on roguing as a means of control showed that a possibility exists of rehabilitating the industry by planting the introduced Putian variety, which six years' observations and inoculation experiments have shown to be highly resistant. The relative resistance of the local Sinibuyas and Kinalabao varieties that survived the disease was not permanent, but these varieties may be planted where the disease has disappeared, if the suckers or rootstocks are healthy and taken from healthy stools, and provided the plantations are regularly inspected. Constant roguing and burning of diseased plants and replanting with healthy ones gave very satisfactory results at Silang experiment station.

BOLSUNOVA (Mme O.) Влияние различной зараженности семян Льна антракнозом на проявление и развитие болезни в посевах. [Effect of varying degrees of infection of Flax seed with anthracnose on the incidence and development of the disease in the crop.]—*Pl. Prot. Leningr.*, 1936, 11, pp. 58–67, 4 graphs, 1936. [English summary.]

After briefly referring to the very great economic importance of flax anthracnose (*Colletotrichum lini*) [*R.A.M.*, xv, p. 369] in the U.S.S.R., the author concisely describes a rapid method devised for the determination of the degree of infection of linseed with the fungus, in which each seed is separately incubated in a drop of water at 20° to 22° C. for 24 or, if necessary, 48 hours, after which time the fungus is easily detected under a low power microscope. It was shown that heavily infected seeds, thoroughly permeated by the mycelium, do not germinate at all. The results of two consecutive years' field tests

showed that sowing linseed with over 15 per cent. infection results in considerably thinned out stands and very uneven growth of the plants, the number of stunted stems proportionately increasing with the degree of infection of the seed. Observations during the two years also indicated that secondary infection rapidly spreads in the field, and in view of this fact it is provisionally recommended that linseed be not used for sowing if it contains 10 per cent. infection or over.

FIKRY (A.). **Egypt : appearance of Antirrhinum rust in the country.**—*Int. Bull. Pl. Prot.*, xi, 1, p. 1, 1937.

In November, 1936, antirrhinum rust (*Puccinia antirrhini*) suddenly appeared on a wide range of commercial varieties near Cairo, this being the first record of the disease in Egypt [*R.A.M.*, xvi, p. 256]. Early sown plants were attacked with particular severity, presenting a scorched aspect and mostly being killed outright. The spread of this disease from America to Bermuda and Europe is briefly traced.

YARWOOD (C. E.). **Physiologic races of Snapdragon rust.**—*Phytopathology*, xxvii, 1, pp. 113–115, 1 fig., 1937.

Excised snapdragon [*Antirrhinum majus*] leaves in a 5 per cent. sucrose solution in Petri dishes were inoculated with two groups of rust (*Puccinia antirrhini*) [see preceding abstract] collections, one from resistant plants grown in several localities of California, where normally rust-resistant varieties were heavily infected in certain coastal regions in 1936, and the other from susceptible individuals at Berkeley, where resistant plants remained free from the disease. The leaves of susceptible plants contracted heavy infection from all the collections, whereas those of resistant plants were attacked only by that from resistant individuals. Resistant snapdragons remained immune from the Berkeley collection in five tests, and from the Davis and Sacramento strains in one. The susceptibility of resistant plants to the rust from five other coastal districts in the State was demonstrated in five experiments. These data are considered to prove the existence of at least two physiologic forms of *P. antirrhini*, that to which the resistant plants are resistant being designated 1, and that attacking the resistant selections 2. Of 11 tested plants of different genetic lines of resistant snapdragons, none gave evidence of resistance to form 2.

FREITAG (J. H.) & SEVERIN (H. H. P.). **Ornamental flowering plants experimentally infected with curly top.**—*Hilgardia*, x, 9, pp. 263–302, 4 pl., 21 figs., 1936.

Curly top of beet [*R.A.M.*, xvi, p. 294] was experimentally transmitted in the greenhouse by the leafhopper *Eutettix tenellus* to 92 species of ornamental flowering plants, in 73 genera belonging to 33 families [cf. *ibid.*, xii, p. 446; xiv, p. 171], including [besides those already noted] *Dianthus barbatus*, *Nigella damascena*, *Papaver nudicaule*, *P. orientale*, *Hesperis matronalis*, *Reseda odorata*, *Pelargonium hortorum*, *Tropaeolum peregrinum*, *Clarkia elegans*, *Primula* spp., *Phlox drummondii*, *Myosotis scorpioides*, *Salvia splendens*, *Digitalis ambigua*, *Chrysanthemum frutescens*, and *Tagetes patula*, the virus being recovered

from each species or variety by previously non-infective leafhoppers, and transferred to sugar beets. Fifteen species failed to develop disease symptoms, though the virus was recovered from them. Apart from stunting, chlorosis, and curling of the leaves, many of the infected plants developed cleared veins, while some showed a roughening of the lower surface of the leaves after the veinlets had cleared, both being reliable symptoms of curly top on sugar beet; the veins in these plants developed numerous tiny, wart-like elevations, papillae and swellings resembling galls developing on the distorted, thickened veins as the disease progressed. Young infected plants frequently produced no flowers, while older plants infected before blooming often developed few, dwarfed, malformed flowers.

NOBLE (MARY). **The morphology and cytology of *Typhula trifolii***
Rostr.—*Ann. Bot., Lond.*, N.S., i, 1, pp. 67–98, 2 pl., 7 figs., 1937.

A full account is given of the author's morphological and cytological studies of *Typhula trifolii* [*R.A.M.*, xv, p. 725] obtained in pure culture from sclerotia found mixed with clover seed imported from Poland. The results showed that *T. trifolii* is heterothallic, and the nuclear phenomena associated with fusion are discussed in considerable detail. Three types of clamp-connexions are described in *T. trifolii*, the first two of which correspond to the two types described by Bensaude in *Coprinus*, while the third, rare type is characterized by the hook growing backward as a small branch, a bridging hypha then being formed between it and the parent hypha. Sclerotia and fructifications are not usually produced in monospore cultures, but those that are occasionally formed are smaller than diploid sclerotia and fructifications, while being otherwise very similar to the latter; the spores of haploid fructifications are smaller than those of the diploid.

ASKEW (H. O.) & THOMSON (R. H. K.). Occurrence of internal cork of Apples in Central Otago, New Zealand.—*N. Z. J. Sci. Tech.*, xviii, 8, pp. 661–664, 1937.

A pitting of Sturmer, Joathan, Dunn's, Canada Reinette, Cox's Orange, French Crab, Rymer, Yorkshire Greening, and Tasma apples in Central Otago, New Zealand, is considered to be identical with the internal cork observed in the Nelson district, and like the latter to be directly correlated with a low boron content of the soil and fruit [*R.A.M.*, xvi, p. 325].

12. Konferenz betr. die Bekämpfung der Krankheiten und Schädlinge der Obstbäume an der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. [12th conference on the control of fruit tree diseases and pests at the Federal Experiment Station for Fruit Growing, Viticulture, and Horticulture at Wädenswil.]—*Schweiz. Z. Obst- u. Weinb.*, xlv, 26, pp. 478–511, 1936.

From the experiments described in the papers herein presented by A. Osterwalder, M. Staehelin, and others, it appears that the so-called 'blue spraying' (4 to 6 per cent. Bordeaux mixture applied shortly before the opening of the buds) is effective against shot hole of cherries (*Clasterosporium*) [*carpophilum*: *R.A.M.*, xiii, p. 582] and apple and

pear scab (*Venturia inaequalis* [and *V. pirina*] in certain circumstances which are fully discussed in relation to local climatic conditions.

JOËSSEL (P. H.). **Les principales maladies cryptogamiques des arbres fruitiers en Provence.** [The chief fungal diseases of fruit trees in Provence.]—[*Rev. maroc.*] *Fruits Primeurs*, vi, 70, pp. 346-350, 1936; vii, 72, pp. 49-54, 1937.

Practical notes are given on the symptoms and control of the chief fungal diseases of fruit trees in Provence [south-eastern France], including *Taphrina deformans* [*R.A.M.*, xiv, p. 594; xv, p. 683] on peach and almond, *Clasterosporium carpophilum* on stone fruits, brown rot (*Sclerotinia fructigena* and *S. laxa*) of various fruit trees, *Venturia pirina* on pear, and *V. inaequalis* on apple. The paper concludes with directions for preparing the spray mixtures recommended, and a spray schedule for the different diseases is given in tabular form.

BOUHELIER (R.). **Traitements en hiver.** [Spray applications in winter.]—[*Rev. maroc.*] *Fruits Primeurs*, vi, 70, pp. 341-345, 1936.

Brief, practical notes are given on winter spray treatments of fruit trees and market garden crops in French Morocco against various diseases, including *Eoascus* [*Taphrina*] *deformans* on almond and peach, *Clasterosporium carpophilum* on almond, peach, plum, and cherry, *Sclerotinia cinerea* [*S. laxa*] on almond, peach, plum, and apricot, *S. fructigena* on apple and pear, *Venturia inaequalis* on apple, *V. pirina* on pear, *Leveillula* [*Oidiopsis*] *taurica* on artichoke [*Cynara scolymus*: *R.A.M.*, xv, p. 683], *Alternaria solani* on tomato, and *Phytophthora infestans* [see below, p. 402], which, while relatively rare on tomatoes, causes much damage to potatoes.

QUANTZ (J. J.). **Motorspritze oder ortsfeste Spritzanlage? Ein Beitrag zur Frage des Einsatzes von Spritzgeräten im Obstbau.** [Motor sprayer or stationary spraying equipment? A contribution to the problem of the installation of spray machinery in the orchard.]—*Obst- u. Gemüseab.*, lxxxiii, 1, pp. 8-10, 1937.

Several experiments with a stationary spray outfit in an orchard of over 1,000 apple trees at Pillnitz on the Elbe, Germany, having indicated that an average profit of at least 20 per cent. of the total value of the harvest may be obtained by this method of treatment, a comparative trial was made of the respective merits of motor and stationary equipments. From a consideration of the statistical data yielded by the tests it appears that the annual profits from the motor and stationary appliances may be estimated, respectively, at approximately RM. 1,427 and 1,707. During the summer of 1936 scab [*Venturia inaequalis*] occurred in the experimental orchard in such a destructive form that the motor sprayer was practically useless on account of the lengthy period required for its operations and of the frequent changes of weather, whereas the work could have been completed by three men in a maximum time of $1\frac{1}{2}$ days with the stationary machine. In summing up the pros and cons of the two methods, the writer concludes that the higher installation and spray material costs involved by the stationary outfit are more than counterbalanced by the great

advantages of the latter as compared with the motor appliances, including adaptability to existing requirements, independence of topographical and soil conditions, economy in wages and working costs, and permanent utility for watering and fertilizing purposes.

ARK (P. A.). **Variability in the fire-blight organism, *Erwinia amylovora*.**
—*Phytopathology*, xxvii, 1, pp. 1-28, 2 figs., 1937.

Morphological studies on ten collections of *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xvi, p. 263 and next abstracts] on Bartlett pear, apple, *Crataegus oxyacantha*, *C. crus-galli*, and *Photinia arbutifolia* from various parts of the United States revealed differences in the sizes of individual cells and of the colonies and in the shape of the latter. The length of the bacteria from strongly and moderately pathogenic collections ranged from 0.9 to 1.4 μ , the corresponding figures for weakly pathogenic strains being 1.5 to 1.7 μ . On an eosin-methylene blue medium a metallic lustre was produced by the weakly pathogenic collections only. The range of hydrogen-ion concentrations tolerated by the strains extended from P_H 4 to 8.8 and the upper thermal death points for the weaker and stronger strains were 45.1° to 48.3° and 48.3° to 49.5° C., respectively. The organisms survived on cover glasses for 24 to 36 hours irrespective of the presence or absence of moisture, and from four to ten days in gauze strips.

The collections were found to vary in their capacity for the utilization of sugars, alcohols, glucosides, amino acids, some proteins, fatty acids, and amides. All fermented arabinose, mannose, glucose, fructose, maltose, cellobiose, sucrose, raffinose, and dextrin, with acid production; galactose and lactose were utilized by seven, mannitol by five, glycerol by eight, asparagin (with alkali production) by all, and ammonium and sodium citrates and citric and malic acids by all. Injections of asparagin into a very resistant plant of *Cotoneaster frigida* and into dormant Bartlett and Winter Nelis pears appeared to stimulate infection by *B. amylovorus* on subsequent inoculation. All the collections were able to grow in 50 per cent. sucrose, while three (two from *Crataegus crus-galli* and one from pear) tolerated 60 per cent. Only the pear strain proved incapable of growth in 14 per cent. glucose, while a Californian collection from *C. crus-galli* developed at a concentration of 28 per cent.

The phenomenon of dissociation in *B. amylovorus* was investigated. Ageing of the cultures was invariably accompanied by the appearance of rough forms, the stability of which was maintained in standard solid and liquid media; a reversion to the smooth type, however, followed four to six passages through 2 per cent. sucrose or 1 per cent. glucose nutrient broth. The smooth forms are the more virulent, the rough and intermediate types originating in old natural infections. Among other cultural variants may be mentioned types producing rhizoid, and others translucent colonies, the latter growing slowly in nutrient broth, requiring frequent transplants for perpetuation, and, like the R strains, failing to attack peas, apple, and a number of Rosaceous shrubs. The invasive capacity of *B. amylovorus* was found to undergo a marked decrease in 10 per cent. sucrose broth cultures. In this connexion it is suggested that a strong influence on the rise and decline of fireblight epidemics

may be exerted by the variations in sugar concentration under natural conditions occurring in the nectar of fruit blossoms and by the dissociation of the organism under natural conditions.

ROSEN (H. R.). **Oversummering of fire-blight pathogen, spraying for control of fire-blight, and abscission induced by *Erwinia amylovora* and *Phytomonas syringae*.**—*Bull. Ark. agric. Exp. Sta.* 330, 60 pp., 13 figs., 2 graphs, 1936.

Studies conducted in Arkansas of the oversummering of fire-blight (*Bacillus amylovorus*) [*R.A.M.*, xv, p. 515 and preceding and next abstracts] in pear twigs and limbs infected early in the growing season showed a gradual reduction in the number of cases in which the organism was still viable; in July, 1934, under 2 per cent. of the infected limbs and twigs studied showed viable, infectious bacteria, the figure being only 0.78 per cent. in August and nil in September. It appears, therefore, that blighted limbs and twigs of the pear and apple varieties grown in Arkansas are much less important sources of inoculum for the succeeding year's infection than is similar infected material in regions with shorter growing seasons. No correlation was noted between the amount of fireblight on individual apple trees in one season and that present in the next.

In 1933, almost perfect control of fireblight, particularly blossom blight, on Jonathan apples was given by Bordeaux mixture (1-3-50) applied (1) as a cluster bud spray, (2) when 25 per cent. of the blossoms were open, (3) when 25 to 80 per cent. were open, (4) as a calyx spray, and (5) as a first cover spray. In 1935, 50 per cent. control of blossom blight was obtained in another Jonathan apple orchard by applications of Bordeaux mixture (1-3-50), including two at the open-blossom stage, the control trees being treated with the usual lime-sulphur sprays, and two open-blossom lime-sulphur applications. The trees sprayed with Bordeaux mixture in the cluster bud and calyx stages and first cover spray but not in the open-blossom stages showed no better control than the lime-sulphur-sprayed controls, the evidence indicating that the two open-blossom Bordeaux mixture sprays were responsible for the control obtained.

Copper sulphate added to dehydrated potato dextrose agar so as to give a concentration equivalent to that in 1-3-50 Bordeaux mixture completely inhibited the growth of *B. amylovorus* [*ibid.*, xvi, p. 44]. Five mg. of dried 1-3-50 Bordeaux film or of dry film of copper phosphate mixture was completely lethal to approximately 10,000 of the bacteria in 10 minutes, but the same weight of a dry film of copper oxide mixture was toxic to about 80 per cent. of such a population in 10 minutes, and was not completely lethal in 30 minutes. When the bacterial population was greatly increased, and the quantity of a dried film of copper phosphate mixture slightly reduced, toxicity diminished in given time intervals. Lead arsenate showed no toxicity to *B. amylovorus*.

ROSEN (H. R.). **Mode of penetration and of progressive invasion of fire-blight bacteria into Apple and Pear blossoms.**—*Bull. Ark. agric. Exp. Sta.* 331, 68 pp., 77 figs., 1936.

This is an expanded account of author's studies of the mode of

penetration of pear and apple blossoms by *Bacillus amylovorus*, preliminary announcements of which have already been noticed [*R.A.M.*, xiv, p. 370; xvi, p. 157, and preceding abstracts]. The following points may be mentioned. It was demonstrated that the nectarial region of pear blossoms, unlike that of apple blossoms, resides in an open, shallow, fully exposed, saucer-shaped tissue between the points of emergence of the styles and stamens. The droplets of nectar are excreted through stoma-like nectarthodes situated mostly at the base of deep depressions in the nectarial surface, which is entirely covered by a well-defined cuticle. Under the epidermal cells lining the nectarial region is a zone of tissue 12 to 15 layers of cells deep, which probably functions in the manufacture of nectar. Within 24 to 48 hours of the inoculation of open, nectar-secreting pear blossoms the bacteria may be found in great numbers in localized areas on and under the surface of the nectarial tissue, penetration of the nectarthode being in the nature of saprophytic growth of the organism through a natural opening into the interior. Progressive invasion by the bacterial strands was accompanied by discoloration, plasmolysis, coagulation, and disintegration of the protoplasts of cells adjoining or immediately near the sub-nectarthode chamber.

The nectarial tissues of normal apple blossoms showed essentially the same histological structures as those of pear blossoms, but when fully open apple flowers are sprayed with pure cultures of *B. amylovorus* penetrations occur more frequently through the stigmas, anthers, outer receptacle walls, and calyx lobes than through the nectarial tissue.

These studies indicate that in spraying against pear blossom blight it is essential to secure covering of the nectarial disks. In the case of apple blossoms a protective covering appears to be more necessary on the stigmas and anthers than on the nectarial surfaces, though the nectarial tissues, outer receptacle walls, and calyx lobes occasionally serve as centres of penetration.

YOSSIFOVITCH (M.). **Contribution à l'étude de la protection du Prunier contre *Polystigma rubrum* (Pers.) D.C.** [A contribution to the study of the protection of the Plum tree against *Polystigma rubrum* (Pers.) D.C.]—*Rev. Path. vég.*, xxiv, 1, pp. 18-31, 1937.

The chief plum variety, Požegača, grown in Jugo-Slavia is stated to be particularly susceptible to infection by *Polystigma rubrum* [*R.A.M.*, xiv, pp. 320, 773], the disease being epidemic and sometimes producing complete defoliation during summer. The disease is equally serious in Bulgaria, where the same variety, known locally as Kustendilska, is also the most widely grown.

Ascospore emission always begins, under Jugo-Slavian conditions, when the first leaves appear on the trees, reaching a maximum shortly after flowering, providing the weather is rainy. The last ascospores to ripen were found in July. In three years out of four the most important attacks occurred during the first half of May, while in the fourth year they occurred even earlier. The critical period for control in the vicinity of Belgrade is that of the first prolonged rains after flowering.

Bordeaux mixture is highly fungicidal to *P. rubrum* even at a concentration of only 1 per cent., and one application when 3 to 5 new

leaves are present on each shoot gave adequate control, reducing the leaf-spotting, as compared with the controls, by 70 to 80 per cent. The first applications should be made a little before or after pollination, according to whether leaf development is more or less advanced in relation to flowering. Treatments made two or three weeks after flowering are practically useless.

MILLER (P. W.). **Second report of progress on studies of Prune russet ('scab') and its control.**—*Rep. Ore. St. hort. Soc.*, 1936, pp. 90–108, 1 fig., 1937.

A tabulated account is given of the writer's continued studies in 1936 on prune 'russet' or 'scab' in Oregon and Washington [*R.A.M.*, xv, p. 375], from which it appears that the critical period for the development of the disorder extended from the time of husk fall to about a month later. By the time the fruit had reached three-fourths of its full size it was no longer susceptible. The disturbance is considered to arise mainly from mechanical abrasions inflicted during windy weather, and the establishment of windbreaks on the windward sides of exposed orchards is recommended. The Miller's Sweet seedling prune showed less severe russet than the adjacent Italian and Date varieties.

WILSON (E. E.). **Control of Peach leaf curl by autumn applications of various fungicides.**—*Phytopathology*, xxvii, 1, pp. 110–112, 1937.

Experiments were carried out in 1935–6 to determine whether peach blight (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: *R.A.M.*, vi, p. 422] and leaf curl (*Taphrina deformans*) [*ibid.*, xvi, p. 234] could be jointly combated on the Elberta variety under Californian conditions by the spray commonly applied against the former disease between 15th November and 15th December, or if a further spring treatment would be necessary. The incidence of leaf curl was reduced to under 1 per cent. (count made on 7th April following a wave of infection probably initiated by a rainy spell from 26th March to 4th April) by treatment with either: 2–5–50 Bordeaux mixture on 24th October, 5–5–50 Bordeaux on 24th October, 29th November, or 29th January, or basic copper sulphate 3–50 on 29th November, and to 1.0 per cent. by lime-sulphur 4–50 on 29th November, the amount of infection in the unsprayed control plots ranging from 36 to 46 per cent.

STEHLÉ (H.). **Sur une maladie des Bananiers à la Guadeloupe.** [On a Banana disease in Guadeloupe.]—*Rev. agric. Guadeloupe*, viii, 9–10, pp. 153–156, 1936.

This is a popular note on the symptoms, etiology, local distribution in Guadeloupe, and control of the banana disease caused by *Bacterium solanacearum* [*R.A.M.*, xv, p. 778]. Soil disinfection with calcium sulphide, chloride of lime, or calcium cyanamide, especially the two first-named, are stated to have given excellent results. Preventive measures should include the selection of healthy planting material, a rational drainage system, and heavy applications (6 to 10 tons per hect.) of lime to laterite and acid soils.

CHEVALIER (A.) & HEIM (R.). **Le noircissement des Bananes des marchés français.** [Blackening of Bananas in French markets.]—*Rev. Bot. appl.*, xvii, 185, pp. 1-4, 1937.

For some time past large numbers of bananas arriving at French ports and markets from the Canary Islands and Guinea have shown stem-end rot, from infected material of which *Gloeosporium musarum*, a *Fusarium*, and a *Verticillium* were isolated, together with a secondary bacterium in the case of the African fruit. Infection is considered to have taken place through injuries in packing, and was artificially reproduced in the laboratory. It is suggested that treatment with organic colouring agents immediately after cutting or before packing might be helpful in control. The condition is stated to be less common on Gros Michel bananas from the West Indies.

DEMAREE (J. B.) & WILCOX (MARGUERITE S.). **Reducing leaf spot and leaf scorch injury to Strawberry calyces by use of a winter mulch.**—*Plant Dis. Repr.*, xxi, 1, pp. 3-5, 1937. [Mimeographed.]

The commercial value of strawberries in Maryland is liable to be much reduced as a result of dead, discoloured calyces due to leaf spot (*Mycosphaerella fragariae*) and scorch (*Diplocarpon earliana*) [*R.A.M.*, xiii, pp. 712, 786], infection with which is favoured by rains at or just before blossoming, or drought during ripening. Records are presented showing that when five standard varieties were mulched with soy-bean hay and wheat straw in late November to prevent freezing at moderate temperatures, the mulch being loosened in spring, when it served for moisture conservation, the unmulched plants after the winter showed 93 per cent. of the calyces affected (62 per cent. badly), those mulched with soy-bean hay and wheat straw showing 54 (25) and 69 (28) per cent. affected, respectively. The berries from the mulched plots were larger and had far more attractive calyces than those from the unmulched. The soy-bean mulch was superior to the straw as regards the resultant vigour and colour of the plants.

BORZINI (G.). **Ricerche su di una Botrytis parassita dei frutti di Kaki (*Diospyros kaki* L.).** [Researches on a *Botrytis* parasitic on fruits of Persimmon (*Diospyros kaki* L.)]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, pp. 299-327, 16 figs., 1936. [Latin and English summaries.]

The author describes a fungal rot attacking persimmons in Italy at the stage between physiological maturity and edible ripeness. The first symptom is a small livid spot over a softened area and subsequent development is of three kinds. Fruits may crack and along the crack mycelium and conidiophores of the fungus may develop, the fruit being rapidly invaded. In the second form of the disease the skin of the fruit is not cracked but a very white central tuft of hyphae is surrounded by three zones, the first being mahogany-brown, the second a lighter mahogany, and the third shading off imperceptibly into the healthy colour. Subsequently, the mycelium invades the whole fruit and forms ashy-grey conidiophores. In the third form of rot the external presence of the fungus becomes apparent only when the livid spot has spread considerably. Affected fruits emit a strong odour of alcohol.

The fungus most regularly found in the infected material was identified from its morphological and cultural characters [which are described] as *Botrytis cinerea*, inoculations with which reproduced the condition in healthy persimmons, and also caused rotting in citrus and other fruits. The close similarity between the morphological and cultural characters and parasitism of the author's fungus and Brizi's descriptions of *B. diospyri* (*Staz. sper. ital.*, xxxiv, p. 767, 1901) and *B. citricola* (*Rend. Accad. Lincei*, xii, [pp. 318-324], 1903) indicate that very probably the two last-named are identical with *B. cinerea*.

BÖTTCHER (F. K.). **Bienensterben durch Schädlingbekämpfung?** [Bee mortality caused by pest control?—*Angew. Chem.*, 1, 3, pp. 81-84, 1937.

In connexion with a study of the harmful effects on bees of various plant protectives in common use it is stated that copper sulphate, extensively applied in Germany against *Peronospora* of the vine [*Plasmopara viticola*], *Fusicladium* [*Venturia* spp.] in orchards, and weeds constitutes no serious menace to the insects in concentrations up to 3 per cent., even when sprayed in the open blossoms, the minimum lethal dose being 3 γ metallic copper [*R.A.M.*, xvi, p. 188]. Lime-sulphur, on account of its repellent odour, is also unlikely to injure bees, and the same is probably true of sulphur and barium sulphide.

BAKER (R. E. D.) & WARDLAW (C. W.). **Studies in the pathogenicity of tropical fungi. I. On the types of infection encountered in the storage of certain fruits**,—*Ann. Bot., Lond.*, N.S., i. 1, pp. 59-65, 1937.

From a brief survey of previous work of various investigators the authors show that the common decay-inducing organisms on certain tropical fruits in storage may be divided into two groups, namely, those that become established as latent infections during the development of the fruit in the field, and the wound parasites present on the surface of the fruit, which usually gain access to the inner tissues during harvesting and storage handling. The tabulated results of their own studies showed that the surface washings from grapefruit collected from six localities in Trinidad contained 25 species of fungi, which are listed, many occurring consistently irrespective of locality. Isolations from the rind of surface sterilized, full-grown grapefruits demonstrated the constant presence in it of three, possibly four, organisms as latent infections, namely, *Phomopsis* [*Diaporthe*] *citri*, *Colletotrichum gloeosporioides*, a tentative species of *Glomerella* which is still under investigation, and *Fusarium* (?) *expansum*, the significance of which has yet to be determined. The *Glomerella* sp. and *C. gloeosporioides* were also found as latent infections in papaws and mangoes, as well as a species of *Phomopsis* closely allied to or possibly identical with *P. citri*. Work is now in hand to determine at what stage in the development of the fruits these fungi become established as latent infections, the data already obtained indicating that some are established very early.

There was evidence that the fungi found in the surface washings of

grapefruits are commonly present in tropical plantations; their spores, which remain viable on the surface of the fruit, are liable to cause rotting later through injury to the epidermis.

COPISAROW (M.). The metabolism of fruit and vegetables in relation to their preservation.—*J. Pomol.*, xiv, 1, pp. 9–18, 1936.

Experimental results are given showing that maleic acid, besides protecting apples, pears, bananas, pineapples, and potatoes from mould and decay [*R.A.M.*, xiv, p. 450] also inhibited the ripening process and germination of these products, a property which it was shown to share with etherial extracts of apples freed from the solvent and dissolved in inert esters. The chemical and physiological similarity of maleic acid and the natural inhibitor in the apple extract, taken in conjunction with the facts that at maturity the inhibitor is succeeded by ethylene as an accelerator, and that there is a constitutional link between maleic acid and the acid fruit constituents, as well as the possible degradation of maleic acid to ethylene, suggested to the author the possibility that maleic acid is identical with the natural inhibitor, studied in greater detail by Kockemann under the name 'blastokolin' (*Ber. dtsh. bot. Ges.*, lii, p. 523, 1934), and that the transition of this inhibitor into the accelerator is represented by the degradation of maleic acid into ethylene.

Besides elucidating an important phase in fruit metabolism, this conception is considered to open up a new field in the problem of fruit and vegetable preservation.

[A brief note on the same subject emphasizing the possibility of substituting the natural inhibitor (maleic acid) for poison sprays as a mode of augmenting the plant's natural means of protection is published in *Science*, N.S., lxxxv, 2196, pp. 120–121, 1937.]

DAVIES (C.) & SMYTH-HOMEWOOD (G. R. B.). Investigation on machinery used in spraying. Part III. The output and range of nozzles and guns.—*J.S.-E. agric. Coll., Wye*, xxxix, pp. 61–72, 1937.

In these further studies [*R.A.M.*, xiv, p. 778] the authors describe an apparatus for measuring the output of spray nozzles, consisting of a large-mouthed funnel big enough to admit any ordinary nozzle cluster, suspended at an angle and provided with a bend so as to break the force of the spray and prevent loss by splashing before the liquid was caught in a vessel suspended on a spring balance. The nozzle being tested was directed by hand away from the funnel until the pump was working at the required pressure, when it was whipped into the funnel for 60 seconds, the weight of liquid (water) delivered being noted and the output in galls. per min. evaluated. The results obtained with a number of nozzles (which are briefly described) are tabulated, showing the output in galls. per minute varied from 0.40 to 5.80 at 200 lb. pressure and from 0.65 to 10.00 at 500 lb.

The effective range of a nozzle was measured to within 6 in. as follows. Its mean effective carry was first judged by competent observers out-of-doors on a still day. The test apparatus was then assembled, consisting of an opposing nozzle producing a wide cone of spray and directed

through a large, louvred funnel towards the nozzle being tested. The pump pressure supplying the opposer was regulated to 170 lb. and the nozzle under test, mounted on a stand on rails, was moved either forwards or backwards until the spray line of demarcation, showing the mean effective carry, was indicated by means of a light aluminium plate suspended on wires and brought into position opposite a pointer. The effective ranges of the nozzles tested varied from 6 in. to 23 ft. at 200 lb. pressure and from 2 ft. to 34 ft. at 500 lb.

Throughout their investigation of the spray gun the authors were impressed with the potentialities of this apparatus, which they consider to be superior to all other spray tools for large and medium trees, though possessing certain serious defects, i.e., the control knob requires to be adjusted continually to produce the desired form of spray, and the necessity of a stuffing-box. Two new types of gun were therefore designed and made (1) semi-automatic, in which the mere raising or lowering of the lance causes the handle to turn the control knob in the correct direction, and (2) automatic, without control knob or stuffing-box, the mere raising or lowering of the gun automatically adjusting the nozzle. For both guns, single, double, and triple nozzle clusters, straight and angled, were designed and successfully tested in the field under commercial conditions. The results of tests of five guns for output and effective range are tabulated.

GALLWITZ (K.). **Aus der Technik der Schädlingsbekämpfung.** [A note on the technique of pest control.]—*Chemikerztg*, lx, 75, pp. 764–766, 4 figs., 2 graphs, 1936.

Aluminium having been proposed as a substitute for brass for spraying-machine parts, samples of the former metal were exposed to the action of Bordeaux mixture, lime-sulphur, nicotine, and nosprasis, and shown to be severely corroded; the protection afforded by a layer of eloxal was inadequate to prevent serious injury. Certain firms are offering rustless and nitralloy steel [cf. *R.A.M.*, xv, p. 452] for the purpose in view, but these metals, though useful for the construction of individual parts, are too costly for use on a large scale.

MUNN (M. T.). **Toxic effect of certain seed treatments as revealed in germination response.**—*Proc. Ass. Off. Seed Anal. N. Amer.*, 1936, p. 92, 1936.

The author calls attention to the difficulties encountered in seed germination tests in germinating disinfected seeds. Poisoning from treatment [cf. above, p. 377] with red copper oxide, for instance, begins when the seeds are placed on blotters to germinate, though seeds given the same treatment do not show this condition when germinated in soil, in the presence of organic matter competing with the copper. Also, slow or erratic germination may result from failure of the seed to take up water owing to the coating of disinfectant, e.g., cabbage seed coated with zinc oxide. Garden peas seed treated with red copper oxide and graphite, or graphite alone, may show retarded germination, the severity of the condition apparently depending on the variety of peas and the amount of covering still adhering.

ISAČENKO [ISSATSCHENKO] (B.). **Sur la corrosion du béton.** [On the corrosion of concrete.] *C.R. Acad. Sci. U.R.S.S.*, ii (xi), 7, pp. 287-289, 1936. [Received March, 1937.]

After briefly referring to the paper by Paine and his collaborators [*R.A.M.*, xii, p. 644] on the relationship of micro-organisms to the decay of stone, the author gives a preliminary report on the results so far obtained in the investigation, started in 1933, on the causes of the corrosion of cement and concrete constructions in fresh waters in the Leningrad region. Submerged concrete walls of electrical works were found to be covered with a compact mucus composed of a rich bacterial flora together with *Oospora lactis*, and species of *Candida* and *Sporotrichum*. The bacteria comprised both nitrifying and denitrifying organisms together with thiosulphate bacteria, and pure cultures of the last-named were shown to be capable of attacking and dissolving concrete, but only in the absence of calcium in the culture medium. The concrete-destroying action of the fungi is believed to be mainly due to their modifying action on the P_{II} value of their substratum in the presence of ammonium salts, which was reduced from 5.6 to 2.7 by *Candida* and from 5.6 to 2.6 by *Sporotrichum*. It is further believed that the decay of concrete constructions is brought about by the dissolving effect of the micro-organisms on the external protective layer, 0.2 or 0.3 mm. thick, of calcium carbonate on the surface of the constructions, this allowing water to penetrate inside the concrete, where the decay is further carried on by the thiosulphate bacteria.

STAKMAN (E. C.). **The promise of modern botany for man's welfare through plant protection.**—*Sci. Mon.*, N. Y., xlv, 2, pp. 117-130, 1937.

This is a stimulating discussion of some outstanding recent developments in the field of plant protection, illustrated by numerous striking examples of parasitic diseases of economic crops and the attempts in constant progress at their control by ecological adaptation, quarantines, eradication campaigns, improved cultural practices, antibiosis, chemical immunization, fungicidal treatments, and breeding for resistance.

HARRY (R. G.). **Mould growth on paint films and its prevention.**—*Paint Varn. Lacq. Manuf.*, vi, 10, pp. 309-311, 6 figs., 1936.

Inoculation tests are described with a number of moulds all of which proved capable of growing under experimental conditions of 80 to 90 per cent. humidity at 20° C. on samples of oak, mahogany [*Swietenia mahoganii*], and white pine [*Pinus strobus*] treated with various paint mixtures [*R.A.M.*, xvi, p. 291]. Under British conditions, no particular material appears to be exclusively responsible for the fungal contamination of paint, suitable media for mould growth being provided by paper, paste, size, and linseed or other vegetable oils. Tests with *Penicillium expansum*, *P. vesiculosum*, *A. glaucus*, and *Fusarium acuminatum* showed that growth can take place on the surface of the paint or distemper itself, although under normal conditions the undercoat may also be involved. *Phoma pigmentivora* Massee (*Kew Bull.*, p. 325, 1911) also

probably grows on the paint film itself, since the red coloration is produced on linseed oil but not on plain malt agar.

Of the various fungicides tested for their efficacy against the paint moulds on Czapek's medium and beer-wort agar, only thymol (0.8 per cent.) and parachlormetacresol (0.3 per cent.) gave satisfactory results, with the exception of mercuric chloride, the high toxicity of which renders it unsafe for general use. Parachlormetacresol is preferable to thymol on economic grounds and may be applied to all groundwork at a strength of 10 per cent. in methylated spirit (or up to 20 per cent. if mould spores are actually known to be present); as an ordinary wash for walls it is effective at 0.2 per cent. The compound should also be incorporated with paint in such a way as to maintain a concentration of 0.3 to 0.4 per cent. in the finished mixture (1 oz. per 16 lb. paint). A fair proportion of zinc oxide, which assists in the inhibition of mould growth, should also be included.

DIXON (H. H.). **Are viruses organisms or autocatalysts?**—*Nature, Lond.*, cxxxix, 3508, p. 153, 1937.

Recent work by Stanley, Bawden, and others [notices of which have appeared in this *Review*] is considered to lend striking support to the opinion long maintained by the writer concerning the autocatalytic (as opposed to organic) nature of viruses [*R.A.M.*, xvi, pp. 114, 212]. This view is based on the absence of a limiting surface between the material of a virus and its host; the velocity of the transmission of its typical symptoms (10 to 30 cm. per hour) in the host tissues; its rapid multiplication; and the infinitesimally small quantities required for inoculation. The autocatalytic theory receives further confirmation from Caldwell's observations on the rapid migration of the viruses from growing tissues [*ibid.*, xvi, p. 346], their passage from cell to cell by way of the plasmodesmata, and their inability to penetrate a barrier of dead cells or unperforated cell walls.

RIVERA (V.). **L'azione biologica a distanza dei metalli. Esposizione di fatti e conferme (1929-1936).** [The biological action of metals at a distance. A survey of the facts and evidence (1929-1936).]—*Ric. sci. Progr. tec. Econ. naz.*, Ser. II, ii, 11-12, pp. 586-603, 1936.

The writer summarizes and briefly discusses some outstanding recent contributions to the knowledge of the action of metals at a distance on various living organisms, including fungi and bacteria [*R.A.M.*, xvi, pp. 48, 200].

McINTOSH (T. P.). **Potato notes.**—*Scot. J. Agric.*, xx, 1, pp. 67-70, 1937.

Leaf roll appears to be more prevalent in Scotland [*R.A.M.*, xiii, p. 721] among the very slow-sprouting potato varieties, such as Golden Wonder, Arran Consul, President, and Bishop, possibly owing to the palatability to aphids of the succulent foliage at the critical period of invasion. An exception to the rule is constituted by the quick-sprouting British Queen, a very susceptible variety, but none of the slow-sprouting varieties are resistant to the disease.

During the recent dry seasons Golden Wonder has been affected by a disorder frequently confused with spraing [*ibid.*, xv, p. 468] but

characterized by a reticulate, brown discoloration of the vascular tissues, and most conspicuous at the heel-end; though not absolutely identical with net necrosis [*ibid.*, xiv, p. 253], this is the term that most aptly describes the condition at the present stage of the studies. Another common disturbance of Golden Wonder, loosely referred to as 'spraing', is internal rust spot [*ibid.*, xvi, p. 118], in which the flesh of the tubers shows irregular, rusty-brown markings ranging from mere specks to blotches 1 cm. or more in diameter.

KLAPP (E.). **Vordringliche Forschungsziele bei der Bekämpfung des Kartoffelabbaus.** [Urgent aims of research in the control of Potato degeneration.]—*Forschungsdienst*, iii, 1, pp. 10–11, 1937.

Among the lines of approach to the problem of potato degeneration control in Germany [*R.A.M.*, xvi, p. 51] the following are in urgent need of attention: testing of certifiable varieties for their reaction to specific virus infections: development of processes for the early testing of planting material; more intensive studies on known modes of infection and the discovery of unknown sources; trials on the effects of selection under varying environmental conditions; experiments on the average distance travelled by the viruses in relation to field practices; and accurate observations on the influence on degeneration of planting and harvest time, density of stand, errors in the fertilizing scheme, and the like, in the principal seed potato-producing areas.

MERKENSCHLAGER (F.). **Nederling und Dahlem. Ein Vergleich zweier Versuchsfelder in Bezug auf die Abbaufolge.** [Nederling and Dahlem. A comparison of two experimental fields in relation to the degeneration problem.]—*Prakt. Bl. Pflanzenb.*, xiv, 10–11, pp. 299–307, 2 figs., 3 diags., 1937.

In connexion with a comparative investigation on the respective merits of Nederling (Bavaria) and Dahlem (Berlin) as potato-growing localities the writer discusses the complex problem of the interplay of geological, climatic, and meteorological factors on the group of pathological manifestations known as 'degeneration' [see preceding and next abstracts]. The environmental conditions conforming most closely with those obtaining in the primeval home of the potato—a cool, damp growing period culminating in a hot, dry harvest—are to be found in the sub-Baltic regions, notably Pomerania, and certain other districts of Germany, and it is here that the best average yields (though not necessarily the largest in a given season) will be secured. Excessively high yields may, indeed, be the immediate outcome of climatic influences which must eventually disturb the natural rhythm and constitution of the plant, i.e. a hot, dry June and July and a damp, cold September. Nederling, with its heavy rainfall, is less liable to severe degeneration over a lengthy period than Dahlem, but the adverse effects of cultivation in the latter region are apt to be largely disguised, more especially when mineral fertilizers are liberally applied.

LOEW (O.). **Über den Abbau der Kartoffeln.** [On Potato degeneration.]—*Prakt. Bl. Pflanzenb.*, xiv, 10–11, pp. 308–310, 1937.

In discussing the etiology of potato degeneration [see preceding

abstracts] the author states that infestation of the leaves with aphids (*Myzus persicae*) only occurs when degeneration has already begun. Hiltner and Lang showed (*Landw. Jb. Bayern*, 1921) that degeneration was preventable at Nederlingen by trebling the normal quantity of stable manure but not even by quadrupling the customary amount of mineral fertilizer. This observation is considered to indicate the decisive influence on degeneration of the water-holding capacity of the soil. The water balance, in fact, in relation to the primitive rhythm of the plant, is thought to be the pivot on which the health of the potato turns; and any disturbance of the equilibrium will be reflected in symptoms of degeneration.

WARTENBERG (H.). **Probleme der Forschungen über den Abbau der Kartoffel. I. Pflanzzeit des Pflanzgutbaues und Pflanzgutwert der Ernte.** [Problems involved in the investigation of degeneration of the Potato. I. Time of sowing in the production of seed material and the seed value of the crop.]—*Züchter*, ix, 2, pp. 35-40, 10 graphs, 1937.

The author states that the results of the so-called 'day plot experiments' [*R.A.M.*, xiv, p. 387] in Dahlem and of Berkner's and Hecker's work in Breslau [*ibid.*, xv, p. 457], supported by other evidence from the relevant literature, indicate that in Germany the spread of potato degeneration [virus] diseases [see preceding abstracts] in the field increases from the earliest to the later sown potatoes up to a certain date (either in June or July), after which the incidence and severity of infection in the later sown crops sharply declines. The later the potatoes are sown after the critical date the healthier they are, but their yield progressively declines both in quantity and in seed value. The Dahlem 'day plot experiments' were repeated by the author in 1935-6, and while no definite conclusion could be arrived at regarding the precise date of the critical period since the varieties varied considerably, there was some evidence that potato crops are most liable to infection when the shoots breaking through the soil are exposed to a relatively high temperature; excessive air dryness and sunshine during the first two weeks after emergence of the shoots also appear to favour infection. The application of these findings to control, by spraying the fields with water or some other fluid during the critical period, with the object of suppressing the insect vector population on the potatoes during that time, is briefly discussed.

KÖHLER (E.). **Die Resistenzzüchtung gegen den Kartoffelabbau im Lichte der Virusforschung.** [Breeding for resistance to Potato degeneration in the light of virus research.]—*Züchter*, ix, 1, pp. 13-15, 1937.

From the practical standpoint the only viruses to be considered in the German potato-breeding programme for resistance to degeneration [*R.A.M.*, xvi, p. 269, and preceding and next abstracts] are leaf roll, Y (streak), and A, and a further simplification may be introduced by the close relationship, amounting virtually to identity, between the two last named, both of which are readily transmissible by rubbing and by *Myzus persicae*, are communicable to tobacco, and lose their

virulence on the exposure of the sap to temperatures above 55° C. Resistance to the relatively strong Y virus automatically connotes a similar reaction to the weaker A. It should be noted, however, that a blend of A and X viruses, the latter innocuous in itself, may result in a virulent combination inducing streak or crinkle symptoms [*ibid.*, xvi, p. 337]. A clear distinction should be drawn between 'defensive resistance' and 'tolerance' in a given potato variety towards a virus, the former being far preferable from the breeding point of view and implying the existence of constitutional protective quantities, whereas the latter is at best a makeshift that does not exclude the risk of conveying 'masked' infection to neighbouring susceptible sorts.

BOTJES (J. G. O.). **Verschil in virulentie bij het virus van de stippelstreepziekte in de Aardappelplant.** [The variation in virulence of the stipple streak disease virus in the Potato plant.]—*Tijdschr. PlZiekt.*, xliii, 1, pp. 1-10, 1937. [English summary.]

Considerable differences have been observed in the virulence of the stipple streak (acropetal necrosis) virus of potatoes [*R.A.M.*, xvi, p. 118], which is harboured in a masked form by a number of Dutch varieties. For instance, the Zeeuwsche Blauwe virus is very virulent to Eersteling [Duke of York] and slightly so to Noordeling and Muntinga 17, whereas the infective principle contained in Eigenheimer severely attacks Noordeling and Muntinga 17 and causes relatively little injury to Duke of York. The Thorbecke virus is equally virulent to Duke of York, Noordeling, and Muntinga 17. The variations in virulence are manifested both in tuber-grafting and plant to plant inoculation tests and are expressed in the more or less rapid spread of the symptoms within the plants. In cases of very slow spread, e.g., where Noordeling and Muntinga 17 are infected by Zeeuwsche Blauwe, healthy progeny may be produced by the diseased tubers.

BOUHELIER (R.). **Les principales affections de la Pomme de terre.** [The chief Potato diseases.]—[*Rev. maroc.*] *Fruits Primeurs*, vi, 69, pp. 213-217, 2 figs., 1936.

Brief, popular notes are given on the symptoms and control of the potato diseases found in French Morocco [cf. *R.A.M.*, xv, p. 171], including leaf roll, mosaic, 'frisolée' [*ibid.*, xvi, p. 298], 'bigarrure' [streak], black leg [*Bacillus phytophthorus*], mildew [*Phytophthora infestans*: see above, p. 389], *Alternaria* disease [*A. solani*], *Verticillium* disease [*V. albo-atrum*], black *Rhizoctonia* disease [*Corticium solani*], dartrose [*Colletotrichum atramentarium*], sclerotial disease [*Sclerotinia sclerotiorum*], common scab [*Actinomyces scabies*], and powdery scab [*Spongospora subterranea*], which is very rare in North Africa. Wart disease [*Synchytrium endobioticum*: *ibid.*, xvi, p. 288] has not been reported for the country.

SCHLUMBERGER [O.]. **Die Erzeugung krebsfester anerkannter Pflanzkartoffeln in den Jahren 1934 und 1935.** [The production of wart-immune certified seed Potatoes in the years 1934 and 1935.]—*NachrBl. dtsh. PflSchDienst*, xvii, 1, pp. 4-6, 1937.

From this tabulated account of the production of seed potatoes

immune from wart disease [*Synchytrium endobioticum*] in Germany in 1934 and 1935 [*R.A.M.*, xv, p. 44] it appears that these varieties comprised 66.4 per cent. of the total material submitted for examination in the former year and 74.5 per cent. in the latter, compared with 55 per cent. in 1933. A marked extension was registered in the cultivation of a number of yellow-fleshed table varieties designed to replace Industrie, e.g., Erdgold, Ovalgelbe, Preussen, Goldwährung, Goldgelbe, Ackersegen, Voran, Jubel, and Daber, of early sorts in general and Flava in particular, and of the starchy group represented by Parnassia.

LEHMANN (H.). **Das heutige Ausgangsmaterial für die Züchtung Phytophthora-widerstandsfähiger Kartoffeln.** [The existing primary material for the breeding of *Phytophthora*-resistant Potatoes.]—*Züchter*, ix, 2, pp. 29–35, 1937.

The author states that his further investigations (not yet published) have demonstrated the existence of eight different biotypes of *Phytophthora infestans* on potatoes [*R.A.M.*, xv, p. 600], widely divergent in their pathogenicity to the wild and semi-wild species of potatoes (*Solanum*) included in the collection at the Kaiser Wilhelm Institute, Müncheberg, Mark. The results [which are tabulated] of artificial inoculation tests, confirmed by field observations, indicated that of this collection *S. demissum* El Desierto alone was immune from all the eight biotypes, while *S. demissum utile* was more or less susceptible to biotype 8; *S. demissum* Lindley 029 proved to be consistently susceptible to this form, *S. ajuscoense* in one case to biotype 6, *S. polyadenium* to biotype 5, and *S. demissum tlaxpehualcoense* to biotype 4. Besides having considerably reduced the number of potato species showing complete immunity from *P. infestans*, the investigations are considered to illustrate the difficulties inherent in the breeding of resistant potato varieties from the material available at the present time, in view of the facility with which the parasite appears to produce new biotypes of unknown pathogenicity.

SCHLUMBERGER [O.]. **Kartoffelsorten-Prüfung auf Schorfwiderstandsfähigkeit.** [Potato variety testing for scab resistance.]—*Mitt. Landw., Berl.*, lii, 3, pp. 52–53, 1937.

As in previous years, official trials were conducted in the Mark Brandenburg in 1936 on the reaction to scab [*Actinomyces scabies*] of potato varieties on three different types of soil—light sand, medium to heavy loam, and soft loam [*R.A.M.*, xii, p. 589; xv, p. 250]. Early varieties were observed to fluctuate much more in respect of susceptibility to infection than the later sorts. The systematic application of physiologically acid fertilizers [*ibid.*, xvi, p. 58] and green manures will largely reduce the incidence of the disease in the semi-resistant varieties. Of the varieties tested for the third consecutive year in 1936, only Volltreffer, Weisses Rössl, and Frühauf satisfied the requirements for practical resistance (at least 60 per cent. of marketable tubers). Of the varieties placed on the standard list in 1936 as a result of the susceptibility tests, Aal, Ackersegen, Jubel, Treff As, and Weisses Rössl are commercially resistant, Edelragis, Erdgold, Ovalgelbe, and Robinia

are moderately resistant, while a lesser degree of resistance is shown by Altgold, Estimata, and Lichtblick.

NOLL (A.). **Der Kartoffelschorf.** [Potato scab.]—*Forschungsdienst*, iii, 1, pp. 26–34, 1937.

This is a review of contemporary literature on potato scab (*Actinomyces scabies*) [see preceding abstract] discussed under the headings of distribution and economic importance, symptomatology, etiology, the genus *Actinomyces*, influence of (a) temperature and humidity, (b) hydrogen-ion concentration, (c) liming, (d) soil constitution, (e) mineral fertilizers, and (f) organic fertilizers, and control.

AHMLING (H.). **Schorfbefall der Kartoffel.** [Scab infection of Potato.]—*Dtsch. landw. Pr.*, lxiv, 5, p. 54, 1937.

Scab [*Actinomyces scabies*: see preceding abstracts] was prevalent in the 1936 potato crop in the Schlotfeld district of Holstein. Of the five varieties grown by the writer, the medium-early Goldappel and Gelbe Nation were the most severely affected on sandy soils while remaining healthy on black humus. The medium-early Erdgold continues to give satisfaction in respect of scab resistance, as does the somewhat later Nordost Goldgelbe; the newly introduced Edda was also resistant.

EDDINS (A. H.). **Sclerotinia rot of Irish Potatoes.**—*Phytopathology*, xxvii, 1, pp. 100–103, 2 figs., 1937.

In cool, wet weather in 1934 *Sclerotinia sclerotiorum* caused heavy damage to the Hastings (Florida) potato crop [*R.A.M.*, xv, p. 781], the yield of which was reduced by up to 25 per cent. Infection was confined to the aerial parts of the plants, the main stem usually being attacked at the soil-line. All the invaded parts, except the lignified tissues, are destroyed, the obstruction of the water-supply leading to the wilt and ultimate collapse of the plants. Sclerotia are formed on the affected surfaces and in the interior of the stems; a single sclerotium gives rise to 1 to 6 apothecia and in 1935 these were observed in the field on 8th February, 11 days before the appearance of the disease on the plants. Both ascospores and mycelium are instrumental in the infection of the stems and leaves. In comparative inoculation tests with *S. sclerotiorum*, *S. minor* [*ibid.*, xv, p. 420; xvi, p. 160], and *S. intermedia* [*ibid.*, xi, p. 556], the first and second infected 20 and 11 out of 20 plants, respectively, producing indistinguishable symptoms, while the third gave entirely negative results. *S. sclerotiorum* was observed on three new hosts in the field, viz. *Calendula officinalis*, *Erechtites hieracifolia* [*E. praealta*], and *Radicula obtusa* [*Nasturtium obtusum*].

BONDE (R.). **A bacterial wilt and soft rot of the Potato in Maine.**—*Phytopathology*, xxvii, 1, pp. 106–108, 1 fig., 1937.

Considerable damage was caused to the Aroostook County, Maine, potato crops in 1934–5 by a chlorotic wilting of the leaves and a white to cream-coloured rot of tubers, through which the disease was found to be perpetuated. A bacterium closely resembling *Bacillus carotovorus*

was isolated from infected material and found to be capable of inducing the white tuber rot, but not the foliar symptoms, on inoculation into healthy plants, while negative results were also given by tests with other organisms from the diseased potatoes. The use of new seed stocks appears to be eliminating the disorder.

REYES (G. M.). **Rice hybrids versus stem rot disease.**—*Philipp. J. Agric.*, vii, 4, pp. 413–418, 3 pl., 1936. (Issued 1937.)

Field experiments carried out in the Philippine Islands to determine the different reactions to *Sclerotium oryzae* [*Leptosphaeria salvinii*: *R.A.M.*, xvi, p. 202 and next abstract] of new rice hybrids developed by the former Bureau of Agriculture, Alabarg, Rizal, showed that Raminad Str. 3, a product of a cross between Ramay and Inadhica, had moderately high resistance, as well as considerable resistance to *Cercospora oryzae* [ibid., xv, p. 60], while also giving outstandingly high yields. It possesses a distinct type of grain, carrying a combination of the features of both parents, and the size of the kernel is intermediate between broad and slender characters; furthermore, the late-maturing character of the resistant female parent was satisfactorily reduced in the hybrid by about two weeks. Other hybrids that have proved reasonably resistant so far to *L. salvinii* are Ramay×Inadhica Str. 3, and Elon-elon×Inadhica Str. 3.

BALDACCI (E.) & CIFERRI (R.). **Ricerche ed esperienze sulle malattie del Riso (*Oryza sativa* L.). I. Prove di patogenicità di funghi diversi per le piantine di Riso.** [Researches and experiments on Rice diseases (*Oryza sativa* L.). I. Tests of the pathogenicity of different fungi for Rice seedlings.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, pp. 161–184, 8 figs., 1936. [Latin and English summaries.]

A description is given of three series of inoculation experiments carried out to ascertain the relative pathogenicity to rice seedlings of (1) *Piricularia oryzae* (Hemmi's strain) [*R.A.M.*, xii, p. 784 and next abstract], (2) *P. oryzae* (Schwarz's strain), (3) *Corticium rolfsii*, (4) *C. centrifugum*, (5) to (8) *Sclerotium oryzae* [*Leptosphaeria salvinii*: see preceding abstract] (Curzi's strain, and strains II, I.M.I., and Nakata I), (9) *Helminthosporium sigmoideum* [*L. salvinii*], (10) *H. oryzae* [*Ophiobolus miyabeanus*: ibid., xvi, p. 202] (Hemmi's strain), (11) *H. oryzae* (strain Miyake (II)), (12) *O. miyabeanus*, (13) *H. sativum* (from wheat) and (14) to (17) four undetermined strains of sterile Basidiomycetes; strains 1, 2, 6, 7, 8, 10, and 11 were obtained from Baarn, strains 3, 4, and 5 from Rome, strains 9, 12, and 13 from Pavia, and the four last were isolated by the authors. In the first series, the germinating, sterilized seed was sown on agarized Sachs's solution and transfers of the fungus made at the same time in proximity to the seeds. In the second, the seeds were sown in one arm of a V-shaped tube containing sterilized soil while the fungus was inoculated into the other arm. In the last series, the seeds were germinated in sand wetted with Sachs's solution and inoculated directly by means of an aqueous suspension of the conidia or direct sowing of the sclerotia.

The results obtained [which are tabulated and discussed] showed that in order of virulence *C. rolfii* and *C. centrifugum* came first, each killing all the seedlings in due course, followed in order by *S. oryzae*, *P. oryzae*, *H. oryzae* (including *O. miyabeanus*), *H. sigmoideum*, the four Basidiomycetes, and *H. sativum* which averaged, respectively, 92, 75, 45, 40, 36 (for the four strains), and 20 per cent. plants killed.

These results do not completely agree with those obtained in similar experiments in Japan, particularly as regards *H. oryzae* and *C. centrifugum* [ibid., viii, p. 263], probably owing to differences in the experimental conditions, but they do agree with general observations on the specialization of the fungi on the various parts of the hosts. It is concluded that all the fungi tested are injurious to rice.

HEMMI (T.), IKEYA (D.), & INOUE (Y.). **Influence of *Ophiobolus miyabeanus* on the penetration of *Piricularia oryzae* in the host body.**—*Agric. & Hort.*, xi, pp. 953–964, 1936. [Japanese. Abs. in *Jap. J. Bot.*, viii, 4, p. (99), 1937.]

The admixture of *Piricularia oryzae* conidia with those of *Ophiobolus miyabeanus* [see preceding abstract] results in a reduction both of germination and of germ-tube length in the former organism, the same effects following the substitution of a culture filtrate of *O. miyabeanus* for the conidia. The process further caused a considerable diminution in the pathogenicity of *P. oryzae* [to rice], *O. miyabeanus* being similarly affected to a much lesser extent. Neither fungus was influenced by the admixture of *Fusarium oxysporum* conidia.

ТСЕРЕМИССИНОВ (N. A.). Микромикеты, наиболее распространенные на Тау-сагызе, ***Scorzonera tau-saghyz* Lipsh. et Bosse.** [The micro-mycetes most common on Tau-saghyz (*Scorzonera tau-saghyz* Lipsh. & Bosse).]—*Тр. Воронежск. Госуд. Унив.* [Trans. State Univ. Voronezh], ix, pp. 83–97, 5 figs. [?1936]. [English summary.]

This is an annotated list of the parasitic fungi recorded from 1933 to 1935, inclusive, in various regions of the U.S.S.R., Russian Central Asia, and Kazakhstan, on *Scorzonera tau-saghyz*, where this plant is being increasingly cultivated as a source of rubber under the vernacular name 'tau-saghyz' [cf. *R.A.M.*, xvi, p. 123]. The economically most important fungi are *Sclerotinia libertiana* [*S. sclerotiorum*], causing a white, wet rot of the root system, with an incidence of 8 to 15.5 per cent.; *Botrytis cinerea* responsible for a serious crown rot; and a species of *Fusarium* giving rise to isolated centres of decay along the whole length of the roots. The last-named is frequently associated with a condition in which a considerable portion of the root, below the point of attack, is transformed into a solid mass of rubber, and experiments are now in hand to establish whether this condition is due to its activity and to test the economic possibilities of its use for this purpose. The leaf parasites include three species which are described as new [with Latin diagnoses], namely, *Septoria tau-saghyzi* (pycnidia immersed, 77.5 to 107.1 μ in diameter, with filiform, straight or curved, hyaline, uni- to triseptate spores, 21.5 to 34.4 by 1.3 to 2.1 μ); *Phyllosticta tau-saghyzi* (pycnidia immersed, 67.8 to 83.6 μ in diameter, with rod-shaped

spores, rounded at both ends, and 6.4 to 8.8 by 2.1 to 3.5 μ); and *Phoma tau-saghyzi* (pycnidia first immersed, then erumpent, globose or depressed, 76.6 to 122.4 μ in diameter, with elongated elliptical or rod-shaped spores, 6.4 to 8.6 by 2.6 to 3.4 μ). A new form, *tau-saghyzi*, of *Leveillula* [*Oidiopsis*] *taurica* [with a Latin diagnosis], is also described on the leaves; it has cylindrical or ovoid asci, 68.8 to 91.8 by 30.6 to 45.9 μ in diameter, with elongated elliptical spores, 30 to 45.9 by 15 to 32.9 μ . Three undetermined species belonging to *Pleospora*, *Mycosphaerella*, and *Macrosporium*, respectively, are also recorded on the leaves.

THOM (C.) & MORROW (MARIE B.). **Fungous mycelia in soil.**—Abs. in *J. Bact.*, xxxiii, 1, pp. 77–78, 1937.

It is possible to divide soil fungi into two groups comprising (1) those capable of living normally in relation to soil organic matter in the chemical sense, i.e., residual products of decomposition, and (2) those concerned in primary decomposition, namely, the breakdown of plant and animal remains into such residual products. The distinction, however, is mainly theoretical. Certain mushrooms, and such organisms as *Actinomyces*, *Penicillium luteum*, *Zygorrhynchus*, and possibly *Trichoderma*, appear to be capable of causing *in vitro* the decomposition of the residual products regarded by the chemist as 'humus'. The majority of soil fungi are directly related to the general disintegration of plant remains in and on the soil surface [cf. *R.A.M.*, xv, p. 51 *et passim*].

WAKSMAN (S. A.). **Associative and antagonistic effects of micro-organisms: I. Historical review of antagonistic relationships.**—*Soil Sci.*, xliii, 1, pp. 51–68, 1937.

A survey of the literature on the antagonistic relationships of micro-organisms, especially those constituting the complex soil population, reveals certain important pertinent facts, which may be summarized as follows. Numerous bacteria, fungi, actinomycetes, and protozoa bring injurious or destructive effects upon themselves or other soil occupants, such effects being sometimes due to competition for nutrients, in other cases to a change in the environmental conditions of the substratum, especially oxidation-reduction potential and reaction, but more often to the formation of definite toxic substances. The production of the latter by specific micro-organisms is strongly influenced by the reaction, temperature, and aeration of the substratum, as well as by the presence of other inhabitants of the soil. Evidence is still lacking as to whether such substances are elaborated in the soil, whether they may be overcome by the organisms affected, and whether they are liable to destruction by other members of the soil population. Without questioning the significance of various specific interrelationships between micro-organisms, no general theory based on 'toxic' or 'antagonistic' phenomena can be proposed before more information is available concerning the mutualistic behaviour of the numerous entities composing the soil population.

A bibliography of 107 titles is appended.

WAKSMAN (S. A.) & FOSTER (J. W.). **Associative and antagonistic effects of micro-organisms: II. Antagonistic effects of micro-organisms grown on artificial substrates.**—*Soil Sci.*, xliii, 1, pp. 69–76, 1937.

The results are here presented of a detailed investigation at the New Jersey Agricultural Experiment Station on the antagonistic action of *Actinomyces* 3065, isolated from peat soil in Scotland, on various soil fungi, including *Trichoderma lignorum* [*R.A.M.*, xvi, p. 308] and a *Mycogone*, when grown on synthetic media [see preceding and next abstracts]. *T. lignorum* was not greatly affected by the early stages of *Actinomyces*, which was, in fact, gradually overcome by the fungus, but in older *Actinomyces* cultures (7 to 18 days) the former developed only to a limited extent, making the yellowish growth characteristic of this organism under abnormal conditions, while the *Mycogone* was almost completely suppressed. The inhibitory effects of *A.* 3065 (another strain, 3347, was less actively antagonistic to the organisms under observation) were found to be specific in nature and not due to nutrient exhaustion or adverse changes in reaction. The toxic substance was rapidly destroyed by aeration (ten minutes) and by boiling.

WAKSMAN (S. A.) & HUTCHINGS (I. J.). **Associative and antagonistic effects of micro-organisms: III. Associative and antagonistic relationships in the decomposition of plant residues.**—*Soil Sci.*, xliii, 1, pp. 77–92, 1937.

A study was made of the associative growth of different fungi, actinomycetes, and bacteria [see preceding abstracts] on various plant materials and of the resultant decomposition of the latter. The presence of one organism was found to modify considerably the growth of another. Thus, the extent of lucerne decomposition by *Trichoderma* [? *lignorum*] was increased by the presence of certain other fungi, such as *Rhizopus* and *Cunninghamella*, which are themselves unable to attack cellulose. Pure cultures of *Actinomyces* failed to attack maize stalks unless combined with fungi, e.g., *T. lignorum* or *Rhizopus*, while the most extensive decomposition of oat straw was also effected by a mixed soil population.

SAWADA (K.). **On the epidemic disease of Cinchona in Formosa.**—*Agric. Rep. Formosa*, xxxii, pp. 1–21, 6 figs., 1936. [Japanese. Abs. in *Jap. J. Bot.*, viii, 4, p. (109), 1937.]

An epidemic disease of *Cinchona* is reported from Formosa, where seedlings 10 to 30 cm. in height are attacked in the seed-beds during the rainy season from May to August. The first symptom is a darkening of the stem, followed by a brown discoloration of the petiole, leaf veins, and lamina, and finally by the death of the plant. Positive results were obtained in inoculation experiments with a non-septate mycelium found in the infected tissues. The fungus, a new species of *Phytophthora*, *P. cinchonae*, differs from that occurring on the same host in India and the Philippines [? *P. palmivora*: *R.A.M.*, xv, p. 410] both in its characteristics and in the symptoms induced.

COOK (M. T.). **The organism causing the dry top rot of Sugar Cane.**—*J. Agric. P. R.*, xxi, 1, pp. 85–97, 3 pl., 1937.

Dry top rot of sugar-cane, attributed by Matz to *Plasmodiophora vascularum* (*Ligniera vascularum* Cook), occurs only in Porto Rico and Venezuela [*R.A.M.*, xiv, p. 397]. The writer disagrees with W. R. Ivimey Cook's conclusion that the disease is due to two rhizopods, *Amoebosporus vascularum* and *A. saccharinum* [*ibid.*, xii, p. 467], and is satisfied that only one organism is involved in its causation. This organism passes, probably in the form of zoospores or as a plasmodium, into the new shoots of the cane, where it is invariably found in the tracheids; in older plants it occurs in other cells. The plasmodia (W. R. I. Cook's amoebae) frequently contain large bodies (W. R. I. Cook's empty cysts) believed by the writer to be resting spores and occurring in large numbers in the tracheids. These structures have been germinated in sterilized distilled water. They develop short germ-tubes by which the zoospores (one to three) probably emerge, though the actual emission of these organs has not been observed. On liberation the zoospores rotate very slowly and gradually assume an amoeboid form. The writer considers that this stage is represented in the tracheids when the individual amoebae unite to form a plasmodium. The resting spores have been observed to show variations in size, but all are believed to belong to the same organism: otherwise two distinct parasites must be presumed to occupy the same cells simultaneously.

With regard to the taxonomic position of the fungus, the writer agrees with Palm and Burk [*ibid.*, xii, p. 468] in their treatment of the Plasmodiophoraceae, and considers that the dry top rot organism would fit into the genus *Sorosphaera* as defined by these authors, where it would become *S. vascularum*, the other alternative being to retain it in *Ligniera*.

KING (R. H.). **An abnormality of growth observed in P.O.J. 2878 and P.O.J. 2714.**—*Sug. News*, xviii, 1, p. 9, 1 fig., 1937.

P.O.J. 2878 and 2725 [2714 in title] canes from seed of Formosan origin growing under widely different soil (loam, clay, and sand) and moisture conditions in the Philippines exhibited during the 1936 season a hitherto unnoticed abnormality, consisting in the profuse formation of new shoots over several entire internodes. The shoots arise from the nodal tissues. The rind of the abnormal portions becomes very hard, the nodes assume a fibrous texture, and the internodes are shortened above and below the affected area. False buds or pigmy shoots are produced along the internode. The upper part of the stalk gradually shrinks and finally dies. The root band and false shoots are abundantly encircled by hairs. A convoluted excrescence, apparently forming part of the internode, develops from the node. About 1 in every 50,000 stools was found to be affected by this pathological condition, the cause of which remains to be determined.

D[ODDS] (H. H.). **Sugar Experiment Station, Mt. Edgecombe. Notes for the month.**—*S. Afr. Sug. J.*, xxi, 1, pp. 17, 19, 21, 1937.

In a series of plots of P.O.J. 2725 sugar-cane the total number of secondary streak [see above, p. 368] infections has increased from

3 to 6 over the past year, the corresponding figure in the Co. 290 plots being from 6 to 14. This rate of infection is extremely slow in view of the total number of stools (160 in the P.O.J. and 576 in Co. 290 series), but it emphasizes the need for the selection of healthy planting material.

Report on the British West Indies Central Sugar-Cane Breeding Station for the year ending September 30th, 1936.—18 pp., 6 diag., [? 1937].

In further work carried out in Barbados on sugar-cane gumming disease [*Bacterium vasculorum*: *R.A.M.*, xv, p. 397] with special reference to the relation between leaf symptoms and systemic infection, the extent of the latter was determined on 20 varieties at five periods by the numbers of gum globules per cane cross-section exuding from the cut ends of cuttings maintained for 24 hours in a moist atmosphere. The results obtained confirmed the conclusion previously reached that, in Barbados, absence or scarcity of leaf symptom development is a true indication of resistance [*ibid.*, xiv, p. 531]. It is now the practice in selection work to eliminate at an early stage in their trials all seedlings showing more than a fixed standard of leaf symptom intensity. In tests of nobilized seedlings the number showing appreciable susceptibility to gumming is stated to be very small.

PILAT (A.). **Additamenta ad floram Sibiriae, Asiae centralis orientalisque mycologicam. Pars quarta.** [Additions to the mycoflora of Siberia and Central and Eastern Asia. Part IV.]—*Bull. Soc. Mycol. Fr.*, lii, 3, pp. 305–336, 7 pl., 5 figs., 1936.

This contribution to the author's series of papers on the fungi of Siberia contains mostly records of Polyporaceae and other Basidiomycetes, with some new species.

WALLACE (G. B.). **A revised list of plant diseases in Tanganyika Territory.**—*E. Afr. agric. J.*, ii, 4, pp. 305–310, 1937.

This revised list, arranged in alphabetical order of the hosts, of the diseases of over 80 plants of economic importance in Tanganyika Territory, contains the records made from 1927 to 1936, and with a few additions and amendments combines the lists already published [*R.A.M.*, xiv, p. 746].

CUMMINS (G. B.). **Descriptions of tropical rusts.**—*Bull. Torrey bot. Cl.*, lxiv, 1, pp. 39–44, 2 figs., 1937.

Descriptions, accompanied where necessary by Latin diagnoses, are given of one new genus (*Lipocystis*, based on *Ravenelia caesalpiniae*), four new species, and two new combinations of tropical rusts.

IKATA (S.). **The function and formation of setae on some anthracnose fungi.**—*Agric. & Hort.*, v, pp. 360–362, 3 figs., 1936. [Japanese. Abs. in *Jap. J. Bot.*, viii, 4, p. (100), 1937.]

On cotton stems and cotyledons heavily infected by *Glomerella gossypii* [*R.A.M.*, xvi, pp. 96, 314] the writer detected the conidial stage, *Colletotrichum gossypii* [*ibid.*, ix, p. 32], showing a profusion of setae, many of which produced conidia at their apices. *Gloeosporium*

kaki, a parasite of persimmon (*Diospyros kaki*), has not been observed to form setae in nature, but these organs were produced on red pepper [*Capsicum annuum*] artificially inoculated with a pure culture of the fungus. The conidial stage [*Colletotrichum capsici*: *ibid.*, xv, p. 344] of *Glomerella capsici* on red pepper is characterized in nature by copious formation of setae, but in inoculation experiments these bodies were produced under dry but not under moist conditions.

The development of setae would appear from these observations to be largely dependent on such environmental influences as humidity and the nature of the host, and it is therefore probably incorrect to regard them as distinctive features for the purpose of specific determination.

HASHIOKA (Y.). **Matériaux pour la flore des Uredinées de l'île de Saghaline septentrionale.** [Materials for the flora of the Uredineae of the island of North Saghalien.]—*J. Jap. Bot.*, xii, 12, pp. 882–886, 1936. [Japanese summary.]

A list is given of 29 rusts collected on various hosts (mostly ornamentals) in North Saghalien, Japan, between 1922 and 1933 [cf. *R.A.M.*, xv, p. 828].

HIRATSUKA (N.). **Gymnosporangium of Japan. I. II. III. IV. V.**—*Bot. Mag., Tokyo*, li, 597, pp. 481–484; 598, pp. 549–555; 599, pp. 593–599; 600, pp. 661–668; 1936; 601, pp. 1–8, 1937.

In this monographic study the writer presents the results [some of which have already been noticed] of five years' work at the Tottori Agricultural College on the taxonomy and biology of the Japanese species of *Gymnosporangium* [*R.A.M.*, xv, pp. 609, 828], and of inoculation experiments carried out by G. Yamada at the Morioka College of Agriculture and Forestry. The teleutospores of *G. haraeaeum* from *Juniperus chinensis* have been found to produce an abundance of aecidia on quince, *Cydonia* [*Pyrus*] *sinensis*, *P. serotina*, pear, *Chaenomeles* [*japonica* var.] *ectus-coccinea* [*P. japonica* var.], and *Photinia laevis* var. *villosa*. Successful results were also obtained in inoculation experiments with *G. miyabei* Yamada & I. Miyake (*Bot. Mag., Tokyo*, xxii, p. 23, 1908) from *Chamaecyparis* [*Thuja*] *pisifera* and its var. *squarrosa* on *Micromeles* [*Pyrus*] *alnifolia*, and with *G. yamadai* from *J. chinensis* [*R.A.M.*, xiv, p. 533] on *Malus* [*P.*] *pumila* var. *domestica*. *G. hemisphaericum*, which is closely related to the foregoing except in the presence of a uredo stage, was first described by Hara in Japanese (*J. For. Soc. Japan*, 419, p. 16, 1917) on *Cornus* [*P.*] *tshonoskii*. Inoculations with the rust from *J. chinensis* gave positive results on *P. tshonoskii* only. Altogether 11 species of *Gymnosporangium* are discussed, with synonymy, habitat, and distribution. Two keys for the identification of the species based on the characters of the teleuto and aecidial stages, respectively, and a bibliography of 117 titles are appended.

GUILLIERMOND (A.). **La classification des levures.** [The classification of the yeasts.]—*Ann. Ferment.*, N.S. (formerly *Ann. Brass. Distill.*), ii, 8, pp. 474–491; 9, pp. 540–551, 21 figs., 2 diags., 1936.

This is a critical review of recent contributions to the classification

of the yeasts, with special reference to the system proposed by Mme Stelling-Dekker [*R.A.M.*, x, p. 692], which the author accepts as generally rational and satisfactory. Certain modifications are necessitated, however, arising partly out of the non-recognition of ascospore conjugation, e.g., in *Saccharomycodes* spp. and *Hansenula saturnus*, and in part out of new observations published since the completion of Mme Stelling-Dekker's investigations. These emendations are incorporated in a table showing the outlines of the revised system.

CORBETT (G.). **Tobacco culture in Mauritius.**—95 pp., 4 diags., Tobacco Bd, Port Louis, 1937.

The section of this treatise dealing with diseases (pp. 63–75) comprises notes in popular terms on the etiology and control of black shank (*Phytophthora parasitica*) [*nicotianae*: *R.A.M.*, xv, p. 203], frog eye (*Cercospora nicotianae*), white rust or mildew (*Oidium tabaci*) [*Erysiphe cichoracearum*], damping-off (*Pythium de Baryanum* and *Rhizoctonia* [*Corticium*] *solani*), Granville wilt (*Bacterium solanacearum*), angular leaf spot (*Bact. angulatum*), mosaic [loc. cit.], frenching [*ibid.*, xv, p. 322], and potash deficiency.

SPENCER (E. L.). **Frenching of Tobacco and thallium toxicity.**—*Amer. J. Bot.*, xxiv, 1, pp. 16–24, 2 figs., 1937.

In a study made to ascertain whether some toxic inorganic substance present in the soil was the cause of tobacco frenching [see preceding abstract] Turkish tobacco seedlings were germinated and cultured in quartz sand, supplied with a nutrient solution, and submitted to the action of 33 selected elements. Mercury, selenium, iodine, cadmium, cobalt, nickel, and thallium were the only elements found toxic to the seedlings in concentrations as low as 5 parts per million and thallium was the only element tested which at this concentration or less produced chlorosis, strap-shaped leaves, and other symptoms of frenching.

The first visible symptom of thallium toxicity was the yellowish-green colour of the young leaves, which was followed by interveinal chlorosis near the base of the midrib of the tip leaf. Subsequently, the chlorosis extended along the midrib, and then diffused laterally towards the outer margins, until it covered the entire leaf, the dark green veins being easily differentiated. Later, the tip leaves became long and ribbon-shaped. Extreme thallium toxicity led to a restriction of terminal growth, and stimulation of the axillary buds, in which growth in turn became restricted; rosettes of small, chlorotic, strap-shaped leaves developed. These symptoms were very similar to those of natural frenching, except that the chlorosis due to frenching develops first at the base of the tip leaf and then extends along the leaf margins instead of the midrib.

The minimum concentration of thallium that produced chlorosis was 0.067 parts per million in nutrient water cultures, 0.10 p.p.m. in quartz sand cultures, 0.38 p.p.m. in orchard soil (a light, sandy, non-toxic loam) watered weekly with thallos nitrate, and 0.25 p.p.m. in field soil (a heavy clay loam that caused severe frenching) treated similarly.

Equivalent amounts of thallium were more toxic to tobacco seedlings in sand when added with a water extract of the field soil than when added with the orchard-soil extract or water alone. Although the orchard-soil extract is not toxic, the additions of a non-toxic concentration of thallium renders this extract toxic. These results indicate that the additive effect of a non-toxic concentration of thallium supplements the activity of some principle already present in the soil that produces chlorosis, and suggest that it may be thallium.

Tobacco species susceptible to frechening were also sensitive to thallium. Turkish tobacco was extremely sensitive to thallium, while *Nicotiana langsdorffii*, *N. rustica*, and tomato, which show only faint frechening, were less sensitive, and *N. glutinosa* and *N. glauca*, which are apparently not susceptible to frechening, were little affected by doses of thallium highly toxic to Turkish tobacco.

Thallium-induced chlorosis was controlled by the addition of nitrogen salts, a dilute solution of aluminium sulphate, and potassium iodide, all of which prevent frechening.

For the final proof of the identity of frechening with thallium poisoning the presence of thallium in soils which produce frechening requires to be demonstrated, but it is doubtful whether chemical methods are available at present sensitive enough to detect such small traces of the element as employed in the experiments reported.

SCHWEIZER (J.). **Jaarverslag Tabak over Juli 1935 t/m Juni 1936.** [Annual report on Tobacco from July, 1935 to June, 1936.]—*Meded. besqek. Proefst.*, 55, 51 pp., 1936.

The phytopathological section of this report (pp. 37–38) contains the following among other items of interest. Mosaic [see next abstract] was very widespread, causing over 70 per cent. reduction of the crop in certain plantations. 'Kroepoek' and 'krekoh' [leaf curl: loc. cit.] were most in evidence along the edges of trenches, paths, and the like, where the wild hosts, e.g., *Polanisia viscosa*, of the Aleurodid vectors (*Bemisia* sp.) of the disease abound. Native tobacco is another source of infection. A dry spell following the development of *Phytophthora* [*parasitica nicotianae*] in the form of foliar spotting at the commencement of the rains arrested the spread of the disease and facilitated the adoption of preventive measures.

VAN DER WEIJ (H. G.). **Ziekten der Tabak. Ex Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1936.** [Tobacco diseases. Ex Survey of the diseases and pests of Deli Tobacco in the year 1936.]—*Meded. Deli-Proefst.*, Ser. II, xcvi, pp. 4–10, 1937.

During 1936 it was necessary to break up 55,406 tobacco seed-beds on account of slime disease (*Bacterium solanacearum*) in the Deli district of Sumatra [*R.A.M.*, xv, pp. 402, 686]. The average incidence of infection in the field amounted to 10.3 per cent., approximately the same as last year. *Bact. pseudozoogloeae* [ibid., xv, p. 749; xvi, p. 214] was responsible for serious damage on a couple of estates. *Phytophthora* [*parasitica*] *nicotianae* [ibid., xv, p. 686] necessitated the breaking-up of 295 seed-beds compared with 109 in 1935, but caused

little trouble in the field. Leaf spot (*Cercospora nicotianae*) [ibid., xv, p. 687] occurred in a virulent form in elevated situations.

There was an appreciable increase in the incidence of mosaic [ibid., xv, p. 686] during the period under review, the plantations reporting 'considerable', 'heavy', and 'very heavy' damage numbering, respectively, 17, 11, and 8 as against 9, 6, and 3 in 1935. 'Gilah' or 'kroe-poek' [identical at least in part with leaf curl: ibid., xi, p. 676; xv, pp. 403, 536], which was remarkably prevalent, was effectively combated on one estate by the eradication of weeds on adjacent strips of ground, thereby minimizing the risk of transmission by white flies (Aleurodidae) [see preceding abstract].

VAN DER POEL (J.). **Verslag van eenige onderzoeken betreffende de oorzaak der natte koppen.** [Report on some investigations concerning the cause of wet stalks.]—*Meded. Deli-Proefst.*, Ser. II, xcv, 19 pp., 1937. [English summary.]

No pathogenic organisms appear from the preliminary studies herein reported to be involved in the causation of a humid condition of tobacco stems known as 'wet stalks' which occasionally entails heavy losses in the fermented product. A correlation has been established, however, between this defect and the abnormally high potash and low lime contents induced by manuring the crop with tobacco ash.

THUNG (T. H.). **Smetsstof en plantencel bij enkele virusziekten van de Tabaksplant III.** [Infective principle and plant cell in some virus diseases of the Tobacco plant III.]—*Tijdschr. PlZiekt.*, xliii, 5, pp. 11-32, 5 pl., 1937. [English summary.]

Continuing his studies on the protective action of certain tobacco viruses against others [*R.A.M.*, xv, p. 533], the writer differentiates four types of antagonism between the ordinary, white, and severe mosaics, ring spot necrosis, Vorstenland distorting strain I, and Holmes's distorting strain, viz., an equilibrium, a predominance, a regulable equilibrium, and a partial predominance. An equilibrium is represented by the evenly distributed green and white pattern formed on the young leaves as a result of simultaneous inoculation with severe and white mosaic. Absolute predominance of ordinary mosaic follows the joint inoculation of this virus and white mosaic into the young foliage, the former also gradually assuming the upper hand even when introduced after the latter. It is possible to regulate the proportions of the green and white pattern induced by Holmes's distorting strain and white mosaic. Thus, the inoculation of a young leaf with the former and of the second underlying leaf with the latter results in the formation of large green areas with a few white spots, while a reversal of this mode of procedure leads to the development of more and larger white spots. The inoculation of two successive leaves results in an intermediate pattern. The same proportions will be maintained in the newly developing foliage. When the Vorstenland distorting strain I and white mosaic are simultaneously inoculated, only the symptoms of the latter appear, but if the white mosaic is introduced 24 hours or more after the Vorstenland strain, a mixture will develop in which the shape is conferred by the latter and the colour by the former. This partial

predominance represents a form of equilibrium to which all the younger leaves will adhere. The inoculation of the sap of leaves showing this blend of symptoms into healthy plants produces only the pure white mosaic.

The velocity of the antagonistic action between the viruses under observation, as expressed by the extent of the white areas in the foliage and less conspicuously in the stems, was found to vary, being greatest in Holmes's distorting strain and least in ring spot necrosis. The inoculation of white mosaic into a young leaf and of one of the other viruses into the fifth underlying leaf results at first only in the development of white mosaic in the young foliage and a white discoloration of the stem. The youngest leaves, however, soon show mixed patterns, Holmes's distorting strain acting the most rapidly. When the white mosaic is inoculated into the fifth underlying leaf, the young upper leaf inoculated with the slowly developing ring spot necrosis also shows white spots, but this is not the case when the upper leaf is inoculated with any of the other viruses.

Inoculations were carried out with white mosaic at different sites on the leaves and stem, the results of which showed that rapidity of development of the symptoms increases parallel with the height of insertion of the virus [ibid., xiii, p. 476]. The inoculation of the lower leaves and stem base causes a white discoloration of the stem spreading rapidly downwards but very slowly upwards. New shoots formed on the white parts of the stem are totally infected by white mosaic.

The immunity from other mosaic viruses conferred by white mosaic appears to be conditional on the interval elapsing between the inoculations and on the age of the plants, very young ones being liable to invasion even by a 'weak' virus. Ring spot necrosis is unable to penetrate the mixed pattern of severe and white mosaic, possibly owing to the production of a blocking element by the latter, and this incapacity extends to the relatively 'strong' ordinary mosaic and Holmes's distorting strain. It is apparent from these observations that previous statements as to the immunizing action of a 'weak' virus against a 'strong' one require rectification in the light of newly acquired knowledge as to the influence of the plant cell on the process in question.

WYCKOFF (R. W. G.), BISCOE (J.), & STANLEY (W. M.). **An ultracentrifugal analysis of the crystalline virus proteins isolated from plants diseased with different strains of Tobacco mosaic virus.**—*J. biol. Chem.*, cxvii, 1, pp. 57-71, 1 diag., 3 graphs, 1937.

A series of ultracentrifugal analyses by the absorption and refractive index methods was made of solutions of the virus proteins derived from plants of different families infected with various strains of tobacco mosaic. The sedimentation constants of these proteins are the largest hitherto found, corresponding to molecules of a weight of several millions (probably in excess of ten) [*R.A.M.*, xvi, p. '212]; in other respects the results obtained are strictly analogous to those given by other large molecules. The constants of these heavy molecules were found to be identical in (1) the untreated juice of diseased plants, (2) solutions of the crystalline mass obtained by centrifuging this juice at

very high speeds, and (3) solutions of the crystalline proteins isolated and purified by chemical methods. Heavy molecules were not found in the juice of healthy plants or in the proteins precipitated therefrom.

The molecular weight of the virus proteins does not change perceptibly within a P_H range of 2 to 9.3. On the acid side of P_H 7 true solutions fall very rapidly with an increase in the hydrogen-ion concentration, most of the protein occurring in the form of colloidal particles with sedimentation constants of the order of 500. In solutions diluted to a concentration of 0.5 mg. protein per c.c. and allowed to stand, unsedimentable material appeared which indicates that under these conditions the large molecules may break up into smaller units.

Differences were detected in the sedimentation rates of different strains of virus proteins (ordinary, aucuba, masked, and 'purified' from a single lesion) and between the proteins obtained at different times from plants inoculated with the ordinary tobacco mosaic virus. Solutions of the virus proteins recovered from tobacco and tomato and from tobacco and phlox plants inoculated with the same strain of mosaic gave identical sedimentation constants.

Treatment of the virus protein with hydrogen peroxide, formaldehyde, or nitrous acid did not disrupt the molecules, but the two latter reagents induced distinct molecular heterogeneity. Some of the virus proteins were molecularly homogeneous, while others showed the broad, diffuse sedimenting boundaries indicative of considerable molecular heterogeneity, and others again, giving double boundaries, contained two well-marked molecular types.

It is apparent from these observations that the virus proteins of the various tobacco mosaic strains consist of a group of related but distinct molecular species. Careful examination has revealed differences in the symptoms evoked in inoculated plants by virus proteins with widely divergent sedimentation constants.

WILKINSON (W. M.). **Chemical studies on the virus of Tobacco mosaic.**

VIII. The isolation of a crystalline protein possessing the properties of aucuba mosaic virus.—*J. biol. Chem.*, cxvii, 1, pp. 325-340, 1 fig., 1937.

A crystalline protein with the properties of the aucuba mosaic virus has been isolated from infected Turkish tobacco plants [see preceding *J. infect.*]. The virus activity, as judged by half-leaf tests on *Nicotiana glauca* and Early Golden Cluster beans (*Phaseolus vulgaris*), chemical composition, optical rotation, crystalline appearance, X-ray diffraction pattern of crystals, and general chemical and serological features of this protein are either identical with, or very similar to, those of the tobacco mosaic virus protein. The aucuba mosaic virus protein is distinguishable from the latter, however, by its larger crystals, more silky and opalescent solutions, lower solubility, more alkaline isoelectric point, and greater sedimentation constant. The isolation from tobacco plants inoculated with aucuba mosaic of a crystalline protein differing from that of tobacco mosaic shows that two distinct strains of a virus give rise to two divergent proteins—a fact considered to be of prime importance as affording at least an indication that viruses may be characterized as separate proteins.

TAKAHASHI (W. N.) & RAWLINS (T. E.). Stream double refraction of preparations of crystalline Tobacco-mosaic protein.—*Science, N.S.*, lxxxv, 2195, pp. 103–104, 1937.

Previous evidence by the authors suggested that tobacco mosaic virus may be composed of submicroscopic rod-shaped particles capable of causing stream double refraction [*R.A.M.*, xiv, p. 521]. Crystal preparations made from infective juice by Stanley's method [see preceding abstracts] (and by a combination of the methods of Vinson and Petre, and Stanley), and colloidal solutions of the preparations containing the crystals, produced stream double refraction. If Stanley's crystal preparations are pure virus, then this virus is capable of causing stream double refraction and, when in colloidal solution, is probably composed of submicroscopic rod-shaped particles. In studies of the relation of hydrogen-ion concentration to intensity of stream double refraction and to active virus concentration it was found that the number of local lesions produced by the virus in *Nicotiana glutinosa* was higher and the stream double refraction lower at P_{II} 7 than at 5·6, and these relations held for unpurified virus as well as the crystal solutions. Determination of virus concentration by stream double refraction should therefore be carried out at the same P_{II} as the control. When diluted to the critical dilution (at which stream double refraction becomes undetectable) the solution of Stanley crystals produced 24 per cent. fewer lesions than the unpurified control virus and the crystals obtained by the combined method 57 per cent. less. If one assumes that the crystal preparations are pure virus, it may be deduced from the results obtained that a significant portion of the virus in the crystals is inactive.

HOLMES (F. O.). Genes affecting response of *Nicotiana tabacum* hybrids to Tobacco-mosaic virus.—*Science, N.S.*, lxxxv, 2195, pp. 104–105, 1937.

The dominant gene for the necrotic type of response to tobacco-mosaic virus, which in a recent communication [*R.A.M.*, xvi, p. 213] was reported to have been transferred from *Nicotiana rustica* to a self-fertile derivative of *N. paniculata* by hybridization of the two species, is now stated to have been carried from the latter to plants of [*N. paniculata* × *N. tabacum*] × *N. tabacum* × *N. tabacum*, the back-cross generations showing considerable deviations from 1 : 1 ratios of necrotic-type to mottling-type plants. A similar gene for necrotic-type response has also been transferred from *N. glutinosa* to three generations of hybrids with *N. tabacum* through hybridizing the latter with *N. digluta* (a fertile amphidiploid *N. glutinosa*–*N. tabacum* hybrid); segregation, however, occurred in the subsequent back-cross generation, the mottling type being in excess of expectations. While it is not yet known whether the necrotic type genes of *N. rustica* and *N. glutinosa* can be incorporated in strains of *N. tabacum* or not, the work is being continued because it is believed that tobacco mosaic would be unable to maintain itself in tobacco varieties bearing these genes, and that this disease, now widely prevalent in other crops, e.g., tomatoes and peppers [*Capsicum annuum*], might disappear if the virus reservoir in tobacco were eliminated or considerably reduced.

JENSEN (J. H.). **Studies on representative strains of Tobacco-mosaic virus.**—*Phytopathology*, xxvii, 1, pp. 69–84, 7 figs., 1937.

The symptoms induced by 12 tobacco-mosaic virus strains, namely green mottling distorting (Johnson's virus 1), yellow mottling distorting (1010), yellow mottling aucuba (108), green mottling aucuba (501), yellow mottling (302), yellow spotting (111), light green spotting (9), mild yellow spotting (104), non-distorting green mottling (502), masked symptom (Holmes), slow moving yellow spotting (3), and necrotic (14), representative of those caused by 55 strains [*R.A.M.*, xv, p. 533], on Turkish tobacco, *Nicotiana sylvestris*, and *N. glutinosa* are described. The slow-moving, necrotic strain (No. 14) killed tomato plants in inoculation experiments. Exceptionally small lesions were produced on *N. glutinosa* by two of the strains (No. 104 and masked symptom). Single pin-puncture inoculations of certain strains (Johnson No. 1 and 104) on young tobacco plants resulted in up to 50 per cent. infection, whereas other strains (111, 3, and 14) were transmitted in less than 1 per cent. of the trials and a further number were intermediate between these extremes. Similar results were given by infectivity tests with the local-lesion method. All the strains tested withstood ten-minute exposures to a temperature of 80° C.

CHAMBERLAIN (E. E.). & CLARK (P. J.). **Nicotine content of Tobacco.**—*N.Z. J. Sci. Tech.*, xviii, 8, pp. 628–637, 3 figs., 1937.

Mosaic was found to cause a marked reduction in the nicotine content of tobacco [*R.A.M.*, x, p. 411] in New Zealand, more especially when infection occurs at an early stage of growth. In the inoculation experiments herein described the reduction was more severe on *Nicotiana rustica* than on the commercial varieties (Turkestan, White Stem Orinoco, Latikia, Warne, and Chloe) of *N. tabacum* tested.

SMITH (K. M.). **Studies on a virus found in the roots of certain normal-looking plants.**—*Parasitology*, xxix, 1, pp. 70–85, 2 pl., 1 fig., 1937.

Continuing his studies of tobacco necrosis [*R.A.M.*, xiv, p. 797; xv, p. 107], the author found that the infective principle occurs not only in the roots of tobacco and *Nicotiana glutinosa*, but also in those of *N. langsdorffii*, tomatoes, *S. nigrum*, *Polyanthus* sp., *Primula obconica*, asters, zonal pelargonium [*Pelargonium zonale*], and French beans [*Phaseolus vulgaris*]. None of these hosts, with the exception of the two first-named, showed external symptoms of infection, but severe although localized necrotic spots could, in many species, be produced by inoculating the leaves with the virus obtained from the roots of the same plant. It was experimentally demonstrated that the roots of tobacco plants, which first gave a negative virus reaction, may contain the principle a few weeks later, as well as the roots of tobacco plants raised from seed which had been heated to a temperature of 75° C. for 10 minutes. Exposure of infected root tissue to this temperature for a similar period, however, inactivated the virus or reduced it to a trace when present in high concentration. All attempts to demonstrate the presence of the virus in the seeds of the various hosts proved negative. There appears to be a wide range of plants which are susceptible to local infection in the leaves by artificial inoculation, since

in a preliminary series of tests lesions were thus produced on about 25 species belonging to ten families.

In considering explanations of the origin and spread of the virus, the author suggests, in view of the strong evidence against the possibility of seed transmission and other modes of dissemination common to most plant viruses, that the infective agent may be, not perhaps a normal constituent of plant roots, but a substance or entity easily produced under certain abnormal conditions, the more so that the disease seems in some way to be connected with glasshouse environment.

SMITH (K. M.). **Further studies on a virus found in the roots of certain normal-looking plants.**—*Parasitology*, xxix, 1, pp. 86–95, 1 pl., 1937.

In the experiments described in this paper it was shown that the roots of tobacco plants raised and grown under aseptic conditions do not contain the necrosis virus which is commonly present in the roots of a number of different plants in greenhouses in Cambridge [see preceding abstract]. It was further experimentally established that the disease is not seed-borne, and that the virus enters the plants from some external source, which in the tests was traced to the sludge at the bottom of the water tanks, whence it was carried to the roots with water; no evidence has so far been obtained that infection may be air-borne. Further tests, performed on French beans (*Phaseolus vulgaris*), which are highly susceptible to artificial inoculation, indicated that the virus may be completely desiccated over sulphuric acid and still retain undiminished infective powers for long periods; so far as tested, it remained infective for six months when stored in absolute alcohol at laboratory temperatures. While in extracted plant sap its thermal death point is only about 72° C., it was not completely inactivated by subjecting it for 15 minutes to 100° dry heat. The suggestion is made that the infective principle may be a transitional stage between a pathogenic and a non-pathogenic substance.

MILLER (J. H.) & CROSIER (W. F.). **Pathogenic associates of Tomato seed: their prevalence, relation to field disease and elimination.**—*Proc. Ass. Off. Seed Anal. N. Amer.*, 1936, pp. 108–111, 1936.

Seed transmission of tomato pathogens was recently emphasized by disastrous outbreaks in the United States of early blight [*Alternaria solani*: *R.A.M.*, xvi, p. 301], bacterial canker [*Aplanobacter michiganense*: *ibid.*, xvi, p. 214], and collar rot [(?) *A. solani* and other fungi: *ibid.*, xv, p. 633], and evidence obtained in 1935 strongly supported the view that commercial seeds were the chief source of primary infection. Examination of 468 samples of seed received at the Georgia laboratory showed that the organisms most commonly present were *A. solani*, *Bacterium vesicatorium* [*ibid.*, xvi, p. 302] and *Aplanobacter michiganense*; *Colletotrichum phomoides* [*ibid.*, xvi, p. 70], *Phoma destructiva* [*ibid.*, xvi, p. 302], and *Fusarium* [*bulbigenum* var.] *lycopersici* [*ibid.*, xv, pp. 537, 615] were noted occasionally.

Many species of *Alternaria* occur on tomato seed as saprophytes or very weak parasites. It was found that not only do seeds carry *A. solani*, but that other Solanaceous plants and soil debris were not

responsible in Georgia in 1936 for overwintering of the fungus and the initiation of primary seedling infections. When clean seeds were planted in two fields severely blighted the previous year, no sign of *A. solani* appeared. Taking an average of all the tests, 1.84 per cent. out of 14,869 untreated tomato seeds were infected by *A. solani*. This figure was reduced to 1.446 per cent. of 70,342 and 1.01 per cent. of 53,433 once- and twice-treated seeds, respectively, this being evidence that both internal and external seed carriage occur in commercial seedstocks. One lot of twice-treated seed showed 1.57 per cent. of *A. solani* in plates, and produced heavy infection on virgin land, though seed showing no infection in plates also showed none in the field, in old or new land.

Bact. vesicatorium and *A. michiganense* were repeatedly obtained in pure culture from commercial seed. One- and two-seed treatments with mercuric chloride reduced infection by *Bact. vesicatorium* from 1.34 per cent. in the untreated controls to 0.872 and 0.389 per cent. respectively; the corresponding percentages for *A. michiganense* being 0.023, 0.0159, and (for twice-treated seeds of other seed stocks) 0.0658.

WILSON (J. D.) & RUNNELS (H. A.). **Five years of Tomato spraying.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xii, 184, pp. 13-18, 1937.

In four out of the five years (1932 to 1936) covered by the writers' spraying experiments against foliar diseases of tomatoes in Ohio, Bordeaux mixture at varying concentrations decreased the yield of the treated plants as compared with the controls [*R.A.M.*, xii, p. 459]. During these seasons disease was negligible or absent. In 1935 considerable defoliation was caused by early blight (*Macrosporium* [*Alternaria*] *solani*) [see preceding abstract], and in the summer of that year the yields were increased from 630 lb. in the untreated plot to 680 lb. and 699 lb. in plots sprayed with 4-4-50 Bordeaux mixture and copper oxychloride plus wyojel [*R.A.M.*, xvi, p. 197] 4-4-50, respectively, the former giving excellent, and the latter fairly good, control of the disease. In 1934 the addition of Volck oil emulsion (1 in 100) to Bordeaux mixture lessened both the excessive transpiration due to the latter and the resultant reduction of yield. A Bordeaux formula with a high hydrated lime and a low copper sulphate content was usually more injurious to the plants than one in which the proportions were reversed. Other copper-containing compounds of low solubility, e.g., copper oxychloride and coposil [*ibid.*, xv, p. 706], caused smaller reductions in yield than Bordeaux mixture. In each of the three seasons when blossom-end rot [*ibid.*, xvi, p. 302] was important, its incidence was increased by Bordeaux mixture and reduced by the oil emulsion.

HENRICK (J. O.). **Blossom-end rot of Tomatoes.**—*Tasm. J. Agric.*, N.S., viii, 1, pp. 33-34, 1 fig., 1937.

On three occasions during the past three or four seasons tomatoes grown in glasshouses in Tasmania have been severely affected by the physiological disorder known as blossom-end rot [see preceding and next abstracts]. Control depends upon very careful and constant

attention to watering (followed on each occasion by surface cultivation to conserve moisture and promote root growth), the accurate adjustment of temperature (65° gradually rising to 75° F. in the younger and fruiting stages, respectively), and improved ventilation.

ROBBINS (W. R.). **Relation of nutrient salt concentration to growth of the Tomato and to the incidence of blossom-end rot of the fruit.**—*Plant Physiol.*, xii, 1, pp. 21–50, 7 figs., 1 graph, 1937.

A detailed account is given of experiments in which tomato plants from a selected strain of the Marglobe variety were grown in sand and watered with solutions of nutrient salts adjusted to concentrations corresponding to five different osmotic pressures, namely, 0.08, 0.44, 0.83, 1.7, and 3.1 atmospheres; two variants were made of the tests with the solution of the lowest concentration, in the first of which the solution was supplied at the rate of 1 l., and in the second at the rate of 4 l. per plant. The results showed, *inter alia*, the dependence of the plant upon abundant water supplies for rapid growth and fruit development. Solutions of low concentration facilitated growth, but in solutions of high salt concentration growth may be limited through lack of water.

No blossom-end rot of the fruit [see preceding abstracts] occurred in the plants grown with the solution of the lowest concentration, whereas nearly 80 per cent. of the fruits in the series with the two highest concentrations showed the trouble, the development of which was associated with wide fluctuations in the rates of transpiration and occurred during periods of high transpiration intensities. In the case of the plants in the lowest concentration series a slight amount of cracking of the fruit occurred under conditions of low transpiration intensity. Special tests revealed a difference of about four atmospheres between the osmotic values of the extracted juices of similar tissues of plants grown with solutions of the lowest and highest concentrations (6.68 to 10.79, and 8.19 to 12.99 atmospheres in the case of the fruits and stems, respectively). An osmotic gradient of 1.62 to 3.63 atmospheres was determined between the extracted juices of the fruits and those from the stems and leaves, the smallest gradient occurring in the plants in the lowest concentration series. The bearing of these findings, as well as that of modifying factors, on the development of blossom-end rot is briefly discussed, and the author concludes that any factor seriously restricting the rate of absorption of water, or greatly increasing the transpiration, will favour the development of blossom-end rot.

WALTON (C. L.). **The cause of a 'spotting' of Tomato fruits (stigmonose).**—*Gdnrs' Chron.*, ci, 2610, pp. 12–14, 2 figs., 1937.

A disorder of glasshouse tomatoes in Somerset designated 'stigmonose' or 'halo spot' and characterized by the development, mostly near the base of the fruits, of well-defined spots each with a puncture-like central marking, frequently showing a slight nipple-like projection, was experimentally shown to be due to the action of sunlight on water droplets of the fruits, and to be preventable by the provision of adequate shading to retard the desiccation of the moisture.

GIGANTE (R.). **Una nuova malattia del Pomodoro.** [A new Tomato disease.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 183–198, 1 pl., 14 figs., 1936.

In 1935 and 1936 the author received diseased tomato material from Sicily the leaves of which showed light green, later yellowish spots between the main veins or scattered irregularly over the surface, and sometimes slight wrinkling. In a more advanced stage of the condition dark greenish-grey or brownish-grey areas became visible on the upper surfaces of the leaves, ranging in size from small spots to areas covering a large part of the leaf. Sometimes they were concentrated toward the apex, at others toward the base, and not infrequently they ran along either or both of the leaf edges. In the final stages, the discoloured areas appeared on the under surface as brownish lesions. No symptoms were apparent on the stem or leaf stalks.

The fruits showed pink, greenish-yellow or greenish, irregularly scattered spots 4 to 15 mm. in diameter, or small, round, or irregularly-shaped, yellowish spots, either scattered over the whole surface or confined to one part. As a rule the affected fruits shrivelled up completely, long before normal ones.

Histological examination showed that the leaf lesions consisted of dead cells; the epidermal cells were flattened and the palisade cells shortened, resulting in a reduction of leaf thickness from 140 to 270 μ in the normal, to 50 to 140 μ in the affected part. The condition produced leptonecrosis and in the fruits necrosis of the vascular bundles was noted.

All attempts at transmission by juice inoculations or by seed gave negative results, but infection was successfully transmitted in two out of five cases by grafting a branch from a diseased on to a healthy plant. It is concluded that the disease belongs to the virus group.

SULIOTIS (M.). **Contributi alla patologia dei Pioppi. IV. Un disseccamento di piantine di Pioppo canadese e P. caroliniano intorno a *Physalospora populina* Maubl. ed una *Phoma* sp.** [Contributions to the pathology of Poplars. IV. A withering of Canadian and Carolina Poplar seedlings associated with *Physalospora populina* Maubl. and a *Phoma* sp.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 5–6, pp. 62–72, 2 pl., 6 figs., 1936.

In April, 1936, Carolina and Canadian poplar [*Populus carolinensis* and *P. canadensis*] seedlings in an Italian nursery were affected by a discoloration and drying up of the bark which began near the top of the trunk and rapidly spread downwards; the wood under the affected parts showed dark streaks or was chestnut-coloured, and where the bark had quite dried up was grey, light, and spongy. The bark bore perithecia of *Physalospora populina*, together with pycnidia of a species of *Phoma*, 150 to 280 μ in diameter, containing elliptical or ovoid, smooth pycnosporos; 5 to 5.7 by 3 to 3.5 μ . The *Phoma* appeared to be identical with that recorded by Maublanc in 1907 as the imperfect stage of *Physalospora populina*.

In cultures on bark decoction agar the ascospores of *P. populina* developed a greyish mycelium with round piriform perithecia, which

after three months were still immature, and subglobose to irregular sclerotia, 300 to 500 μ in diameter. No pycnidia were observed. The *Phoma* pycnosporos produced on the same medium and on Richards's agar a macroscopically identical colony with that of *Physalospora populina* but formed true pycnidia after four months; sclerotia were produced after 25 days. Subsequent transfers gave abundant pycnidia which, like the spores, were identical with those observed in nature and generally arranged in irregular masses of 3 to 20. Repeated inoculations of a healthy Canadian poplar seedling with both organisms gave negative results. The author agrees with Maublanc that the organisms are genetically connected and considers they may perhaps be parasitic. Further investigations are to be made.

GOIDÀNICH (G.). **Morfologia, biologia e sistematica di un fungo parassita delle foglie di Pioppo (*Stigmina radiosa* (Lib.) G. Goid.).** [Morphology, biology, and taxonomy of a fungus parasitic on Poplar leaves (*Stigmina radiosa* (Lib.) G. Goid.).]—Reprinted from *Ann. Bot., Roma*, xxi, 2, 12 pp., 5 figs., 1936.

An account is given of the morphology, systematic position, and biology of the leaf parasite of *Populus canadensis* previously known as *Fusicladium radiosum* [Venturia tremulae: R.A.M., xi, p. 136] but renamed by the author *Stigmina radiosa* [ibid., xvi, p. 71]. The fungus forms a loose subepidermal stroma, and the hyphae emit laterally cone-shaped, later nearly oval protuberances, 15 μ long, each of which is cut off by a basal septum and develops into a conidium, two further cross septa being formed. The conidia are oval, smooth, markedly constricted at the septa, 21 to 37 by 8.5 to 14 μ in diameter, and germinate by the emission of a germ-tube from one of the two lateral cells.

The author considers that the fungus is not a *Fusicladium*, as it does not possess true conidiophores, and transfers it to *Stigmina* as *S. radiosa* (Lib.) G. Goid. because in this genus of leaf parasites the conidiophores are very short or non-existent. Synonyms of the fungus include *Oidium radiosum* Lib., *Napicladium tremulae*, *Fusicladium asteroma*, and *Fusariella populi*.

The fungus also attacks *P. nigra*, *P. tremula*, and *P. alba*, and has been found in France, Denmark, Germany, and Russia. In Italy it occurs in Venetia, Lombardy, Piedmont, Liguria, Emilia, and Tuscany. It is a true parasite, though infection is favoured by humid conditions.

VIENNOT-BOURGIN (G.). **Contribution a l'étude de la flore cryptogamique du bassin de la Seine (11^e note). Deux Urédinées nouvelles.** [A contribution to the study of the cryptogamic flora of the Seine basin (11th note). Two new Uredineae.]—*Rev. Path. vég.*, xxiv, 1, pp. 78–85, 2 pl., 1937.

Descriptions are given of two new rusts found in the vicinity of the Seine. *Puccinia lolivcola* n.sp. occurred in the uredo and teleuto stages on *Lolium perenne* and *L. italicum*. The uredosori are confined to the leaves, on the upper and lower surfaces of which they appear in a discoloured epidermal zone; they are linear in shape, measuring 0.5 to 2 mm. in length, and are never confluent or in series. The epiphyllous, occasionally hypophyllous, round, or angular teleutosori are also con-

finned to the leaves, and measure 0.4 to 1 mm. in length. The paraphyses are claviform or, usually, widely thickened at the tip, and divide the sori into ovoid compartments. The species differs from *P. glumarum* in the arrangement and dimensions of the sori, the presence of orange uredosori, and in the grouping of the paraphyses. *Melampsora allii-populina* Kleb. *muscaridis-populina* f. nov. was found in the *Caeoma* form on *Muscari comosum* Mill. and (following inoculation) on *Allium sphaerocephalum*, and in the uredo and teleuto stages on *Populus nigra*. The new variety differs from *M. allii-populina* [R.A.M., xv, p. 683] in the nature of the echinulations and the dimensions of the teleutospores which measure 28 to 54 by 14 to 21 μ , and are usually smaller than those of *M. allii-populina*.

DOMINIK (T.). **Spostrzeżenia i rozważania nad holenderską chorobą Wiązów powodowaną przez *Graphium ulmi* Schwarz.** [Some observations on the Dutch Elm disease caused by *Graphium ulmi* Schwarz.]-*Roczn. Nauk rol.*, xxxviii, 1, pp. 134-140, 3 pl., 1937 [French summary.]

The writer discusses the relations between the various climatic conditions prevailing in different parts of Europe and the acute or chronic development of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*), with special reference to the Paris basin and western Poland [R.A.M., xv, p. 407], the general conclusion being reached that violent attacks are to be expected in western Europe while in western Poland a mild form is nearly always assumed. Brown streaks in the wood of diseased trees are not considered to be a reliable diagnostic feature and must be confirmed by isolation of the fungus in pure culture. In the writer's opinion the extensive distribution of the disease throughout Europe entirely precludes any effective measures of control.

SOLOVYEV [SOLOVIEFF] (F. A.). **Болезни и повреждения Пробкового Дуба, произрастающего на Кавказе.** [Diseases and injuries to which the Cork Oak is subject in the Caucasus.]-*Mitt. forsttech. Akad. Leningr.*, 1936, 47, pp. 39-80, 8 figs., 1936. [German and English summaries.]

A phytopathological survey in 1934 showed that cork oaks (*Quercus suber* and *Q. occidentalis*) in the Caucasus suffer considerable damage from ink disease, especially on exposed northern slopes and on poorly drained, clay soils. The disease is characterized by the formation of brownish-black, shiny, diffuse spots on the bark, due to the drying up and oxidation of the exuded sap. These spots occur mostly at the lower part of the trunk, more rarely on the twigs of the crown. In heavy infections the leaves assume a pale green colour and wither, the twigs die back, and finally the tree succumbs. While the etiology of the disease still remains to be elucidated, it is stated that numerous fructifications of a fungus identified as *Endothia parasitica* [R.A.M., xv, p. 692] were found on the branches and twigs of oaks that had been killed by the disease, a fact which requires further investigation. [No description of the fungus is given.] The economic importance of the ink disease may be gauged from the fact that in three localities the incidence varied from 24 to 65.5 per cent. of the trees, many of which

were dead. Trunk rots are also widespread [ibid., xvi, p. 4], chiefly owing to the defective methods used in barking the trees; among the fungi responsible for them special mention is made of *Stereum hirsutum*, which is stated to be the predominant species, *S. subcostatum*, *Polyporus cuticularis*, *P. giganteus* [ibid., xi, p. 680], *Daedalea quercina*, and *Fomes fomentarius*. *Vuilleminia* [*Corticium*] *comedens* is fairly frequent on dying and dead branches and twigs. In certain localities the acorns were found to be largely attacked and mummified by *Sclerotinia pseudotuberosa* [ibid., xv, p. 616]; stored acorns are often affected by moulds, among which species of *Penicillium* and *Aspergillus* are prevalent. Rather frequent is a condition of the bark in which the inner layers of the cortex become abnormally water-soaked and assume a dark discoloration; the presence of a mycelium in the bark suggests that the disease is of fungal origin. Some recommendations are made for the surgical and antiseptic treatment of diseased groves.

MILLER (P. W.). **Sixth Report of progress on Walnut blight and its control in Oregon.**—*Rep. Ore. St. hort. Soc.*, 1936, pp. 134–151, 1937.

Further studies on the control of walnut blight (*Phytophthora* [*Bacterium*] *juglandis*) [*R.A.M.*, xiv, p. 477] in Oregon showed that where frequent, prolonged rains occurred during the critical period for infection three applications of Bordeaux mixture in the early pre-blossom stage, late pre-blossom stage, and immediately after blossoming reduced infection to an insignificant amount, control being obtained under less severe conditions by the two last applications only. Bordeaux mixture 2–2–50 was practically as effective as higher concentrations, but the evidence showed that lower concentrations are ineffective in epidemic outbreaks. Dusts were less satisfactory than the 2–2–50 spray, and are not recommended. The spraying did not interfere significantly with the setting of the nuts, but in many cases injured the young leaves especially when high concentrations (e.g. 4–4–50) were used. In general, the higher the temperature at the time of spraying the greater was the resultant injury. Foliage injury was appreciably reduced by the addition to the spray mixture of fish or mineral oil (1 pint per 100 galls.).

MILLER (P. W.). **Current studies on the bacterial blight disease of Filberts and its control.**—*Rep. Ore. St. hort. Soc.*, 1936, pp. 152–159, 1937.

Further studies in Oregon of filbert [*Corylus avellana*] blight (*Phytophthora* sp.) [*? Bacterium juglandis*: *R.A.M.*, xv, p. 617] showed that during 1936 the disease was very prevalent and destructive in the Pacific Northwest, probably owing to frequent, prolonged rains during the critical infection period and low temperatures early in the preceding November. The fruits were found attacked for the first time, but the direct crop loss was small as the lesions were mostly confined to the shell; the indirect loss from the killing of pistillate flower buds, and nut-bearing shoots and branches was, however, considerable.

Two critical infection periods occur, in the autumn or early winter, and again in early spring, the former being apparently the more

favourable to infection. In 1936 the disease reached its peak in the latter part of May, development being largely over by midsummer.

COLE (J. R.) & LARGE (J. R.). **Low lime Bordeaux mixture, copper sulphate solution, and copper sulphate solution plus summer oil emulsion as sprays used for the control of Pecan scab.**—*Proc. S.-E. Pecan Grs' Ass.*, xxx (1936), pp. 10, 11, 13-18, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvi, 3, p. 352, 1937.]

Good control of pecan [*Carya pecan*] scab [*Cladosporium effusum*] in the south-eastern United States [*R.A.M.*, xiii, p. 812] was obtained in 1935 by one to two pre-pollination applications of a weak, low-lime Bordeaux mixture (2-0.5-50), followed by the scheduled number of cover sprays consisting of 2-0.5-50 or 3-1-50 Bordeaux or copper sulphate (1 lb. to 50 galls.) plus 1 qt. summer oil emulsion.

PLAKIDAS (A. G.). **Diseases of Tung trees in Louisiana.**—*Bull. La Univ.* 282, 11 pp., 6 figs., 1937.

Brief notes are given on the diseases of tung trees [*Aleurites fordii* and *A. montana*] in Louisiana. Bacterial leaf spot (*Bacterium aleuritidis*) [*R.A.M.*, xii, p. 130], observed in 1935, is characterized by angular, dark brown to nearly black spots on the upper leaf surface, which appear light brown on the under surface. The centre is usually lighter than the border, and a wide, yellowish halo is present. The spots may coalesce. Nut rot, caused by a species of *Dothiorella*, probably *D. (Botryosphaeria) ribis* [ibid., xvi, p. 335], causes the nuts to turn brown and fall prematurely or become mummified. Branch and twig cankers, also caused by a species of *Dothiorella* (*Botryosphaeria*), occur on older branches and young shoots, the fungus in the former type of injury being apparently a secondary invader of wounds.

Crown girdle, apparently the same as that affecting pears [ibid., xv, p. 514], causes yellowing and wilting of the foliage in late summer, the bark and cambium of the trunk at the crown being killed. A canker extends to 10 in. or more above the ground and below to the main roots. Later, the main roots become affected. Plaques of white mycelium usually occur between the killed bark and the underlying wood, and between the layers of the bark. A species of *Botryosphaeria* is constantly associated with the disease, other fungi frequently isolated being *Cephalosporium* sp., *Diplodia* sp., and *Clitocybe* sp. The fungi are thought to gain entrance through frost injuries.

Interveinal browning, characterized by regularly arranged spots between the larger veins of the leaves, is apparently non-parasitic in origin; it is common but only of minor economic importance. In its mild form the disorder is limited to the upper leaf surface, but in its severe form it extends to the lower surface, the brown tissue in the older spots being necrotic. 'Translucent' spot at first appears as a roughening on the under epidermis of the leaves, the spots showing as irregular, ashen-grey, raised patches which coalesce and cover 90 per cent. of the under surface; invisible on the upper surface, they can be seen through it when the leaf is held against the light. Later, brown necrotic spots appear, at first pin-point in size, but enlarging and becoming visible on the upper surface. The disease is unimportant and

thought to be non-parasitic. In the trouble known as 'white tree' the trees are stunted, and the leaves about one-eighth of normal size, erect, and with margins that cup upwards. The under leaf surface is pubescent and whitish, while the upper shows irregular brown spots or patches usually following the veins. The bark is light-coloured, and the trees either do not set fruit at all, or if they do, the nuts do not fill well. The cause of the condition has not been ascertained.

BECKER-DILLINGEN (J.). **Die Gelbspitzigkeit der Kiefer, eine Magnesia-Mangelerscheinung.** [Yellow tip of the Pine, a magnesia deficiency phenomenon.]—*Ernähr. Pfl.*, xxxiii, 1, pp. 1-7, 1 col. pl., 8 figs., 1937. [English and Spanish summaries on pp. 19-20.]

A particularly serious form of chlorosis of pines expressed by yellowing of the needle tips is caused by magnesium deficiency, and may be controlled, as shown by recent experiments on a poor diluvial sand in the Uckermark district of the Province of Brandenburg, by the application to the affected stands of potash magnesia at the rate of 180 lb. per acre.

HIRT (R. R.). **The possibility of Ribes infection by aeciospores of Cronartium ribicola at temperatures above 19° C.**—*Phytopathology*, xxvii, 1, pp. 104-106, 1937.

Aecidiospores of *Cronartium ribicola* from *Pinus strobus* in New York [see above, p. 357] were experimentally shown to be capable of 31 per cent. germination at a maximum temperature of 28° C., the corresponding figure at the optimum of 11° to 12° being 83 per cent. The capacity of the rust for germination at a relatively high temperature may be of importance in connexion with *Ribes* infection in the newly invaded regions.

NAZAROVA (Mme E. S.). **Болезнь Сосен, вызываемая Sclerophoma pithyophila v. H.** [Pine disease caused by *Sclerophoma pithyophila* v. H.]—*Bull. Acad. Sci. U.S.S.R., Sér. biol.*, 1936, 6, pp. 1191-1208, 11 figs., 1936. [English summary.]

This report embodies the results of the author's studies during three consecutive years of a diseased condition of pines [species not mentioned] in the neighbourhood of Moscow, characterized both by a die-back of the apical shoots and lateral twigs, and the formation of numerous witches' brooms in the crowns of the trees, the affected trees ranging in age from 10 to 70 years. Pycnidia of *Sclerophoma pithyophila* [*R.A.M.*, xii, p. 790] were consistently present on affected needles and bark, and affected tissues of the needles and shoots (including the witches' brooms) were found to contain a mycelium of the fungus which, on isolation in pure culture, yielded three distinct strains differing slightly in morphological and cultural features. It was shown experimentally that the fungus is pathogenic to pines, its entry being chiefly effected through wounds, although it can also penetrate the unwounded surface of shoots growing very slowly. Histological studies of the witches' brooms showed that the fungus causes hypertrophy of the cells of the medullary rays, enlargement of the parenchyma, and distortion and disorientation of the tracheids and of

the cambium. The fungus is destructive to lignin and owing to this fact, as well as to its capacity to cause blue stain of the wood, the timber from diseased trees cannot be recommended as first-class building material.

CHILDS (T. W.). **Variability of *Polyporus schweinitzii* in culture.**—*Phytopathology*, xxvii, 1, pp. 29–50, 3 figs., 1937.

Cultural studies of 50 mycelia of *Polyporus schweinitzii* [*R.A.M.*, xvi, p. 358] from various coniferous hosts in widely separated localities throughout the Northern Hemisphere (*Pinus strobus* in the eastern United States and Canada, *P. sylvestris* in Germany, Norway, and Great Britain, *P. rigida* in the United States, *Picea canadensis* in Canada, *P. sitchensis* in Canada and Germany, *Larix europea* in Sweden, *L. laricina* in the United States, *Thuja plicata* in Canada, and unspecified trees in Canada and Japan) showed the fungus to be composed of individuals differing considerably in cultural characters, sporophore production, growth rate on nutrient agar, acidity reactions, and apparently also in the capacity for causing decay in white pine wood. Individual differences were also observed between monosporous mycelia arising from spores produced by pure cultures on malt extract agar. There was no evidence of local or host-specialized strains within the fungus, the serious damage caused by which to planted white pines in New York is therefore probably attributable to site conditions rather than to any extraordinary virulence on the part of the organism in these plantings. The differences shown to exist between individual strains of *Polyporus schweinitzii* are comparable to those demonstrated by Miss Mounce for *Fomes pinicola* [*ibid.*, viii, p. 690], and indicate that research on such variable species involves the study of a large number of individuals if generally applicable results are to be obtained.

FINDLAY (W. K. P.). **Further tests on chemical treatments for the control of sap stain.**—*Timb. News Sawm. Chron.*, xlv, 2035, pp. 566, 568, 1937.

The outcome of tests at the Forest Products Research Laboratory on the chemical disinfection of Scots pine [*Pinus sylvestris*] timber against blue stain and mould [*R.A.M.*, xvi, p. 290] denoted that absolutely clean sapwood may be secured by dipping the boards, after sawing, in an effective fungicide, such as L.E. 5 (0.25 per cent.), lignasan (0.25 per cent.) [*ibid.*, xv, p. 281], or dowicide P. (1 per cent.) [*ibid.*, xiv, p. 729], of which the first-named, a miscible oil, used in the form of an emulsion, is particularly easy and convenient to apply. Reasonable provision for drying and ventilation should be made during the period of stacking in the open.

VANINE (S. I.). Влияние начальных стадий гнили на пропитку древесины антисептиками. [Effect of the first stages of decay on the impregnation of timber with antiseptics.]—*Mitt. forsttech. Akad. Leningr.*, 1936, 47, pp. 22–38, 7 figs., 1936. [German and English summaries.]

A tabulated account is given of experiments on the impregnation of timber showing initial stages of rotting, using samples 15 by 3 by 3 cm.

Pine timber showing the first symptoms of decay caused by species of *Stereum* and *Corticium* may be treated with mineral and oil antiseptics in the same way and as effectively as sound timber. Spruce wood in the first stage of rot caused by *Trametes abietis* [*R.A.M.*, xiii, p. 604] is much more readily penetrated by a mixture of creosote with a black mineral oil than sound wood, and in the initial, brown stage of the rot caused by *Peniophora gigantea* [*ibid.*, xiv, p. 270] it absorbs this mixture a little better than healthy wood. This preparation, however, penetrates greyish-brown discoloured maple wood attacked by *Fomes connatus* [*ibid.*, xv, p. 66] much less satisfactorily than sound material. Blue staining of timber [*Ceratostomella* spp.] was found not to interfere with the capacity of the timber to absorb either mineral or oil antiseptics.

BURGWITZ (G. K.) & NAZAROVA (Mme E. S.). О действии инфракрасных лучей на грибы, разрушающие древесину. [The action of infra-red rays on wood-destroying fungi.]—*Bull. Acad. Sci. U.S.S.R., Sér. biol.*, 1936, 6, pp. 1173-1190, 1 graph, 1936. [German summary.]

In experiments on the action of infra-red rays [*R.A.M.*, xv, p. 624], either direct or through wood screens (1.8 to 3.6 cm. thick), on pure cultures of *Merulius lacrymans* and *Poria vaporaria*, the temperature at the surface of the cultures during irradiation being regulated at different degrees by means of artificial ventilation, it was found that the growth of both fungi was stimulated by direct irradiation for from 5 to 15 minutes at 30° C., but was depressed after one hour; depression also followed after 5 minutes' irradiation, when the temperature was allowed to rise to 59°. Death of the *P. vaporaria* cultures ensued after 5 minutes' direct irradiation at 69°, and of *M. lacrymans* at 80°. There was evidence that the growth-retarding or lethal effect of the rays is not due to their heating properties alone, but that they also exert a specific, electromagnetic action on the fungi. This specific action of the infra-red rays was considerably reduced when wood screens were interposed, the observed growth-retarding effects of the irradiations in these cases being chiefly attributed to heat waves, which after a certain time were emitted by the irradiated screens.

WOOLEY (J. C.). **Effect of treatment on fence posts.** *Bull. Mo. agric. Exp. Sta.* 374, 12 pp., 1 fig., 2 diags., 1 graph, 1937.

Further studies on the effect of various preservative treatments on fence posts in Missouri [*R.A.M.*, xii, p. 1] indicate that, taking 1 $\frac{3}{4}$ cents as the maximum post year cost (first cost plus cost of treatment/years of service) allowable, only a limited number of timbers and methods are economically feasible. White walnut [*Juglans cinerea*], white elm [*Ulmus americana*], and honey locust [*Gleditsia triacanthos*] should be painted with hot carbolineum, which also enhances the durability of white oak [*Quercus alba*] and *Sassafras*, though not indispensable for the two last-named. Osage orange [*Machura aurantiaca*], *Catalpa catalpa*, white cedar [*Thuja occidentalis*], and black locust [*Robinia pseudacacia*] can safely be employed for the purpose in view without treatment. Submerging butts in hot creosote (for 1 or 2 $\frac{1}{2}$ hrs.) and then in cold (for similar periods) gave the greatest percentage gain in service, but the cost per post year was too high to be economical.

Standard specifications for creosote. A.S.T.M. Designation : D390-36.

Standard specifications for creosote coal-tar solution. A.S.T.M.

Designation : D391-36.—*A.S.T.M. Stand.*, 1936, 2, pp. 527-530, 1936. [Abs. in *Build. Sci. Abstr.*, N.S., x, 1, p. 22, 1937.]

It is laid down by the American Society for Testing Materials that creosote for use in the preservative treatment of timber shall be a distillate of coal gas or coke oven tar conforming to the following requirements: water content not to exceed 3 per cent.; matter insoluble in benzol not more than 0.5 per cent.; specific gravity 38° C./15.5° C. not less than 1.03; distillation, based on water-free oil, up to 210° C. not more than 5 per cent., and up to 235° C. not more than 25 per cent.; and coke residue not more than 2 per cent.

Creosote coal-tar solution for the same purpose shall be a product of which at least 80 per cent. shall be a distillate of coal gas or coke oven tar conforming to the following requirements: water not to exceed 3 per cent.; matter insoluble in benzol not more than 2 per cent.; sp. gr. 38° C./15.5° C. not less than 1.05 or more than 1.12; distillation, based on water-free oil, up to 210° C. not more than 5 per cent., and up to 235° C. not more than 25 per cent.; and coke residue not more than 6 per cent. Sampling and testing methods are prescribed for both materials.

ATTILA (S.). **Protection of wood against rotting.**—*Tekn. aikl.*, xxvii, p. 22, 1937. [Finnish. Abs. in *Chem. Abstr.*, xxxi, 8, pp. 2770, 1937.]

The use of Wolman salts is stated to have considerably reduced the cost and simplified the process of timber impregnation in Finland. They may be used in pressure tanks and also for painting, immersion, the Boucherie method, and drilling. Thanalith-U [*R.A.M.*, xv, pp. 333, 547] is the most toxic to wood-rotting fungi even at the low concentration of 0.5 per cent. and the most resistant to lixiviation.

BRYSON (H. C.). **The preservation of wood against fungi and insects.**—*Paint Technol.*, i, 12, pp. 429-431, 1936; ii, 13, pp. 17-20; 14, pp. 51-53, 7 figs., 1937.

A popular account is given of the depredations of wood-destroying fungi and insects, together with a discussion of the problems of control. The writer has found that copper naphthenate [*R.A.M.*, xv, pp. 413, 622] (20 to 25 per cent. in naphtha, white spirit, or other solvent, 1 gall. per 200 sq. ft.) is an excellent fungicide with none of the drawbacks of coal-tar creosote. Where the brilliant green colour of this compound is objectionable, it may be replaced by the practically colourless zinc naphthenate, the toxic properties of which, however, are not so pronounced. Full directions for impregnation are given.

BRANDENBURG (E.). **Die sogenannte Glasigkeit der Steckrüben.** [The so-called glassiness of Swedes.]—*Z. PflKrankh.*, xlvii, 1, pp. 53-58, 1937.

The writer's observations in Germany indicate that 'glassiness' ('brown heart') of swedes [*R.A.M.*, xvi, p. 225 and next abstract], due to boron deficiency and controllable by treatment with 15 to 20 kg. borax per hect., is not restricted, like the analogous heart and dry

rot of beets, to dry soils with an alkaline reaction. It may therefore be expected to appear in districts where the corresponding beet disease is unknown.

COULSON (J. G.) & RAYMOND (L. C.). **Progress report on the investigation of brown heart of Swede Turnips at Macdonald College.**—*Sci. Agric.*, xvii, 5, pp. 299–301, 4 figs., 1937.

In greenhouse tests carried out in Quebec to study the relation of boron deficiency to brown heart of swedes [see preceding abstract] plants grown in pure sand cultures with a nutrient solution containing no boron remained normal for six to eight weeks, after which they developed yellowish, mottled, distorted leaves and died without forming a bulbous root. When 0.25 p.p.m. of boron were added, there developed purpling of the leaf-margins and under-surfaces, curling, ruffling, yellowing, and mottling of the leaf blades, galling and splitting of the petioles, midribs, and veins, rough skin, and reduced roots, together with very severe brown heart, and some cambial disintegration. With increased amounts of boron these symptoms became progressively less severe, no brown heart occurring with 2 p.p.m. or higher concentrations. Toxic effects began to show at 25 p.p.m., and increased progressively with added boron, but even with 100 p.p.m. plant development was quite good.

The amount of brown heart varied greatly from year to year in the same field, ranging in one selfed line during a five-year period from 38 to 80 per cent. Varietal susceptibility in a number of commercial varieties and a large group of selfed-line strains ranged from 11 to 73 per cent. brown heart; some varieties were markedly resistant but none was completely so. The average amount of brown heart for the period 1932 to 1934 on land given manure alone since 1912 was 72 per cent., on that given mineral fertilizer alone 99 per cent., and a combination of both was 89 per cent. In 1932 the mineral fertilizer alone gave 100 per cent. and the manure alone 60 per cent. brown heart. In greenhouse trials increasing soil acidity with hydrochloric acid from P_H 6.1 to 5.2 almost completely eliminated the disease, while raising the P_H value of the same soil to 7.2 with sodium hydroxide or lime markedly increased severity. Brown heart has been much reduced by maintaining a high soil moisture by irrigation.

In field tests in 1935 soil applications of 25 and 50 lb. borax per acre gave 14.22 and 5.78 per cent. brown heart, respectively, as against 46.67 per cent. in the untreated control. Applications of 20 lb. per acre or less in the same field in 1934 gave no control, the high amount of borax required probably being due to the calcareous nature of the soil (P_H 6.5 to 6.9).

WRIGHT (L. E.). **The rôle of elements other than nitrogen, phosphorus and potassium in crop production.**—*Sci. Agric.*, xvii, 5, pp. 283–293, 1937.

The author briefly discusses the place of calcium, magnesium, sulphur, iron, manganese, copper, zinc, and boron in plant nutrition [*R.A.M.*, xvi, p. 283] and outlines the results obtained during the past year from applications of 'trace elements' in experiments at Kentville,

Nova Scotia. In the experimental plots mangolds had been affected since 1926 by a physiological disorder resembling sugar beet crown rot, the symptoms consisting of a curling of the leaves, followed by browning or blackening of portions of the edges and stem, the leaves and stems sometimes finally falling away from the crown. An application of borax at the rate of 10 lb. per acre was given in the spring of 1935, and this completely controlled the disease on limed and unlimed plots (with soluble boron contents of 0.24 and 0.20 p.p.m., respectively), and increased the yield by 217 and 100 per cent., respectively, over that of the plot which did not receive boron but in all other respects received identical treatment.

The addition of magnesium and manganese was somewhat beneficial on unlimed plots, whereas zinc exerted a depressing effect on growth. Neither these elements nor copper increased the yield on the limed plots.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Regulations governing sanitary export certification.—3 pp., 1936.

Details are given of the revised rules and regulations, effective as from 21st September, 1936, and superseding those of 23rd July, 1931, governing the issue of sanitary certificates for the export of plants and products thereof from the United States. A fee of \$1 is chargeable for each certificate granted.

Importation of Plants and Potatoes (Jersey) Order of 1936. Importation of British Potatoes (Jersey) Order of 1936. Guernsey Ordinance No. 9, 15th February, 1936.—6 pp., 1937. [Mimeographed.]

The regulations governing the importation of plants into Jersey (operative for a period of three years from 12th April, 1936) are concerned not only with the exclusion of new pests and diseases from the Island, but also with the prevention of their introduction, by way of Jersey, into England and Wales. With these ends in view, the importation of potatoes is prohibited from the United States, Canada, France [*R.A.M.*, xii, p. 799], Germany, Belgium, Denmark, and the Netherlands, and permitted from other countries only on production of a certificate vouching for the absence of wart disease (*Synchytrium endobioticum*) from a radius of 2 km. surrounding the place of cultivation, and further guaranteeing the variety to be officially recognized as immune. Regulations have further been made against the importation of elm trees and conifers [*ibid.*, xiii, p. 63] and sugar beets and mangolds [*ibid.*, xv, p. 335]. The importation of British Potatoes (Jersey) Order of 1936 requires that all potato consignments from England, Wales, Scotland, Northern Ireland, the Isle of Man, and the Irish Free State shall be accompanied by certificates vouching for the absence of *S. endobioticum* during the last three years from a radius of 500 yards from the place of cultivation.

Guernsey Ordinance No. 9 (15th February, 1936) brings the plant importation restrictions of the Island into line with the provisions of the English Importation of Plants Order of 1933 and the Destructive Insect and Pests Order of 1933 [*ibid.*, xii, p. 800; xiv, pp. 272, 400].